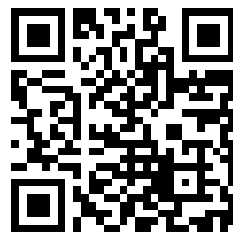

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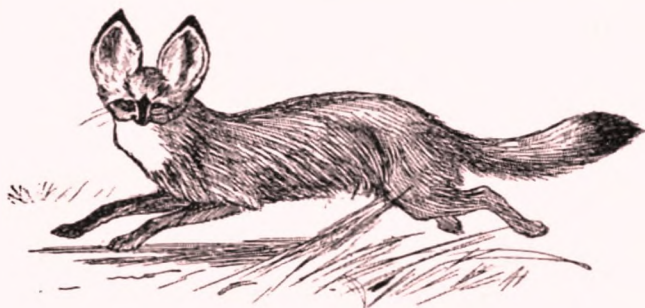
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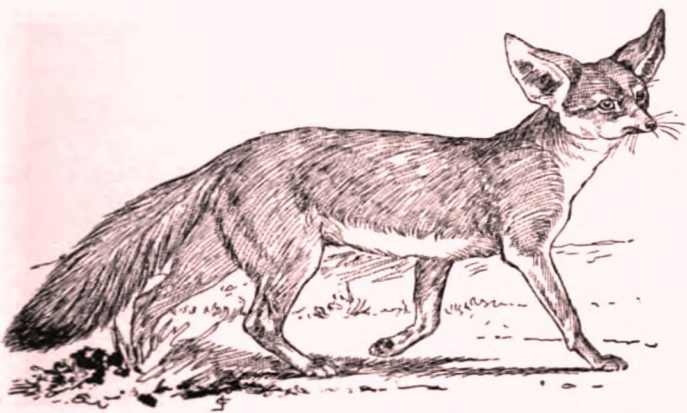




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*The New International
Encyclopaedia*



THE NEW INTERNATIONAL ENCYCLOPÆDIA

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KEY TO PRONUNCIATION.

ä	as in ale, fate. Also see <i>ø</i> , below.	D	as in the Spanish Almodovar, pulgada, where it is nearly like <i>th</i> in English then, this.
“	“ senate, chaotic. Also see <i>ø</i> , below.	g	“ “ go, get.
“	“ glare, care.	G	“ “ the German Landtag, and <i>ch</i> in Feuerbach, buch; where it is a guttural sound made with the back part of the tongue raised toward the soft palate, as in the sound made in clearing the throat.
“	“ am, at.	H	as <i>j</i> in the Spanish Jijona, <i>g</i> in the Spanish gila; where it is a fricative somewhat resembling the sound of <i>h</i> in English hue or <i>y</i> in yet, but stronger.
“	“ arm, father.	hw	“ <i>wh</i> in which.
“	“ ant, and final <i>a</i> in America, armada, etc. In rapid speech this vowel readily becomes more or less obscured and like the neutral vowel or a short <i>u</i> (<i>ü</i>).	K	“ <i>ch</i> in the German ich, Albrecht, and <i>g</i> in the German Arensburg, Mecklenburg; where it is a fricative sound made between the tongue and the hard palate toward which the tongue is raised. It resembles the sound of <i>h</i> in hue, or <i>y</i> in yet; or the sound made by beginning to pronounce a <i>k</i> , but not completing the stoppage of the breath. The character <i>k</i> is also used to indicate the rough aspirates or fricatives of some of the Oriental languages, as of <i>kh</i> in the word Khan.
α	“ “ final, regal, where it is of a neutral or obscure quality.	n	as in sinker, longer.
“	“ all, fall.	ng	“ “ sing, long.
“	“ eve.	N	“ “ the French bon, Bourbon, and <i>m</i> in the French Etampes; where it is equivalent to a nasalizing of the preceding vowel. This effect is approximately produced by attempting to pronounce ‘onion’ without touching the tip of the tongue to the roof of the mouth. The corresponding nasal of Portuguese is also indicated by <i>N</i> , as in the case of São Antão.
“	“ elate, evade.	sh	“ “ shine, shut.
“	“ end, pet. The characters <i>ě</i> , <i>ä</i> , and <i>ä</i> are used for <i>ä</i> in German, as in Gärtner, Gräfe, Hähnel, to the values of which they are the nearest English vowel sounds. The sound of Swedish <i>ä</i> is also indicated by <i>ě</i> .	th	“ “ thrust, thin.
“	“ fern, her, and as <i>i</i> in sir. Also for <i>ö</i> , <i>œ</i> , in German, as in Göthe, Goethe, Ortel, Oertel, and for <i>eu</i> and <i>œu</i> in French, as in Neufchâtel, Crèveceur; to which it is the nearest English vowel sound.	TH	“ “ then, this.
“	“ agency, judgment, where it is of a neutral or obscure quality.	zh	as <i>z</i> in azure, and <i>s</i> in pleasure.
“	“ ice, quiet.		An apostrophe ['] is sometimes used to denote a glide or neutral connecting vowel, as in tā'b'l (table), kāz'm (chasm).
“	“ quiescent.		Otherwise than as noted above, the letters used in the respellings for pronunciation are to receive their ordinary English sounds.
“	“ ill, fit.		When the pronunciation is sufficiently shown by indicating the accented syllables, this is done without respelling; as in the case of very common English words, and words which are so spelled as to insure their correct pronunciation if they are correctly accented. See the article on PRONUNCIATION.
“	“ old, sober.		
“	“ obey, sobriety.		
“	“ orb, nor.		
“	“ odd, forest, not.		
“	“ atom, carol, where it has a neutral or obscure quality.		
“	“ oil, boil, and for <i>eu</i> in German, as in Feuerbach.		
“	“ food, fool, and as <i>u</i> in rude, rule.		
“	“ house, mouse.		
“	“ use, mule.		
“	“ unite.		
“	“ cut, but.		
“	“ full, put, or as <i>oo</i> in foot, book. Also for <i>ü</i> in German, as in München, Müller, and <i>u</i> in French, as in Buchez, Budé; to which it is the nearest English vowel sound.		
“	“ urn, burn.		
“	“ yet, yield.		
“	“ the Spanish Habana, Córdoba, where it is like a <i>v</i> made with the lips alone, instead of with the teeth and lips.		
“	“ chair, cheese.		

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THE NEW INTERNATIONAL ENCYCLOPÆDIA

FONTANES, fɔ̃n'tan', LOUIS, Marquis de (1757-1821). A French poet and political orator. He was born at Niort, March 6, 1757, and was of an ancient Protestant family of Languedoc. He went to Paris while still a youth, and at twenty-one had attracted attention as poet by *Le cri de mon cœur* (1778) and *La forêt de Navarre* (1778). A little later he published a scholarly translation of Pope's *Essay on Man* (1783). During the early years of the Revolution he was active as a moderate Republican journalist, and before the fall of Robespierre was in hiding for a time. Later he was constrained to take refuge in Hamburg, whence he went to London, and became a close friend of Chateaubriand. While in England he published a much-admired imitation of Gray's "Elegy," *Le jour des morts* (1796). He returned to France in 1799, was reinstated in the Institute, of which he had been made a member in 1795, and, warmly espousing the cause of Napoleon, was made member of the legislative body (1802-10), of which he became president in 1804. Here he developed great oratorical talent in praise of the First Consul and Emperor. He was advanced to the Senate (1810), but he adapted himself readily to the Restoration after Leipzig, drew up Napoleon's act of abdication (1814), and was made peer by Louis XVIII. He died in Paris, March 17, 1821. Fontanes's works, edited by Sainte-Beuve in two volumes (1837), are models of elegant and correct diction, and show sound literary judgment.

FONTANGES, fɔ̃n'tanzh', MARIE ANGÉLIQUE DE SCORAILLE DE ROUSSILLE, Duchesse de (1661-81). A mistress of Louis XIV. She was born at the Château of Croprières in Auvergne, as the daughter of the Marquis de Roussille. Maid of honor to Madame, the Duchess of Orleans, she attracted the attention of the King, who made her Duchesse de Fontanges. She bore the King a son, and shortly afterwards died at the Abbey of Port Royal.

FONTARABIA. See FUENTERRABIA.

FONTENAY, fɔ̃nt'ná'. A small town near Auxerre, in Lower Burgundy. It is memorable for the battle fought there in 841, between the three sons of Louis the Pious, which decided the fate of the Carolingian Empire. The Emperor

Lothair, who was defeated, was obliged in 843 to consent to divide the Empire with his two brothers by the Treaty of Verdun (q.v.).

FONTENAY-LE-COMTE, fɔ̃nt'ná'le-kɔ̃nt'. The capital of an arrondissement in the Department of Vendée, France, situated on both banks of the Vendée, 27 miles northeast of La Rochelle (Map: France, E 5). It is an old-fashioned town, with the two fine Gothic churches of Notre Dame and Saint Jean, and in the public square a fountain in Renaissance style, from which the town derives its name; there are also a college and a handsome theatre. There are linen and cloth and saw mills, and three important annual fairs are held. Population, in 1901, 10,512. The town suffered considerably during the religious wars, and was captured by the Royalists in 1793.

FONTENAY-MAREUIL, fɔ̃nt'ná'mà'rè'y', FRANÇOIS DU VAL, Marquis de (c.1594-1665). A French soldier, diplomat, and historian. He was brought up at the Court of Louis XIII.; served with Mayenne in Spain; with Nevers at Ratisbon; under Boisdapin at the siege of Soissons (1617); in 1619 in Normandy; at Saint-Jean d'Angély, Clérac, and Montauban (1621); at Saint-Antoine and Montpellier (1622); at the Ile de Ré (1627); and at the sieges of La Rochelle (1628), of Privas and of Alais (1629). From 1630 to 1633 he was Ambassador to England. After taking part in various campaigns against the Imperialists and Spaniards, he was Ambassador at Rome from 1640 to 1650. His memoirs were published at Paris in 1826.

FONTENELLE, fɔ̃nt'nél', BERTRAND LE BOVIER (1657-1757). A French scientist, philosopher, poet, and dramatist of acute wit and great power of popular presentation. He was born at Rouen, February 11, 1657, and was a nephew of Corneille. He was trained by the Jesuits, studied law, but abandoned it for literature and science, in which he soon earned distinction. He was secretary of the Academy of Sciences from 1699 to 1741, and edited its *Mémoires* and *Eloges* on deceased members with admirable care. His dramatic and poetic work is negligible, but his literary studies on the French stage before Corneille and the origin of fables are still of interest. His *Histoire des oracles* (1687), *Entretiens sur la pluralité des mondes* (1686), and the *Dialogues des*

morts (1683), imitating Lucian and suggesting Lancelotti, were once very popular, and aided in spreading the scientific and rationalistic spirit. He died in Paris, January 9, 1757. He had an acute mind, a dry, epigrammatic style, a calm judgment, a didactic temper, a kindly character. The best edition of his works is in 3 vols. (Paris, 1818). Consult Faguet, *Dieu huitième siècle* (Paris, 1894), and the brief but acute criticism in Lanson, *Histoire de la littérature française* (5th ed., Paris, 1898).

FONTENOY, fɔ̃t'no' (older form *Fontenet*, from Lat. *fontanus*, pertaining to springs, from *fons*, fountain). A village of Belgium, in the Province of Hainaut, five miles southwest of Tournai. Here, on May 11, 1745, the French, 55,000 strong, under Marshal Saxe, defeated an equal number of English, Hanoverians, and Dutch under the Duke of Cumberland. The fight was obstinate to the last, and was decided only by a smashing charge of the Household Troops and the famous Irish Brigade. The Allies lost 10,000 men, the French 7000. Coming at the same time as the threatened Stuart invasion, the defeat was a great blow to England.

FONTEVRAULT, fɔ̃t've-rɔ' (Fons Ebraldi—the well of Saint Evrault). A town in the Department of Maine-et-Loire, France, on the Vienne, eight miles southeast of Saumur (Map: France, G 4). Population, in 1901, 2352. It is celebrated for the remains of the famous abbey founded in 1099 by Robert d'Arbrissel, a Breton monk. It consisted of five churches, a monastery, a nunnery, a magdaleneum, and a hospital. One church remains, a splendid example of twelfth-century architecture, of which only a part is now devoted to divine service. It contained the tombs of several members of the royal Plantagenet family of England, and still possesses the effigies of Henry II. and his Queen Eleanor of Aquitaine, of Richard Cœur de Lion, and of Isabella of Angoulême, wife of King John. The Tour d'Evrault, the sixteenth-century chapter-house, the refectory, and the cloisters are of great archaeological interest. In 1804 the buildings were inclosed by walls, and converted into a huge penitentiary and industrial prison for eleven neighboring departments, with accommodation for 2000 prisoners. Napoleon III., in 1867, occasioned a national outburst of indignation by offering the Plantagenet statues to Queen Victoria, a vandal act that was frustrated by the refusal of the prison director to deliver them to the English agent. Consult Edouard, *Fontevault et ses monuments* (2 vols., Paris, 1875).

FONTEVRAULT, ORDER OF. A monastic Order following the Benedictine rule, founded by Robert d'Arbrissel. He was born in 1047, and took his doctor's degree in Paris. As Vicar-General of the Diocese of Rennes, he devoted himself zealously to the extirpation of clerical concubinage and simony. Later he took up the life of a hermit in the forest of Craon, between Anjou and Brittany. The fame of his sanctity attracted disciples, whom in 1094 he formed into a community under the rule of Saint Augustine at La Roe. He received special permission from Pope Urban II. to preach the Crusade; but in 1099 he founded a community at Fontevault (q.v.) for persons of both sexes who preferred a life of penance at home. As several houses developed, of which those for women were especially dedi-

cated to the Blessed Virgin, Robert placed those for men also under the jurisdiction of the Abbess of Fontevault as superior of the whole Order, representing the heavenly patroness. The first abbess was Hersende, a kinswoman of the Duke of Brittany. They were pledged to observe the Benedictine rule in its full rigor, not eating flesh even in sickness. Paschal II. confirmed the Order in 1106 and 1113. The founder died in 1117, after establishing numerous cloisters; more than sixty arose after his death on the same model, principally in France, though a few extended to England and Spain. The Order ultimately declined, in spite of the efforts at reform of three of its abbesses, Mary of Brittany (1477), Renée of Bourbon (1507), and Antoinette of Orleans (1571-1618), and finally became extinct.

FONT'HILL ABBEY. See BECKFORD.

FONTPERTIUS, fɔ̃t'pɛr'ty', ADALBERT FROUT DE (1825—). A French writer, born at Rennes. He entered the marine artillery, but left it for the civil service, and was chief prefect of the Division of Eure-et-Loir, from 1853 to 1865. His writings include a number of essays for scientific and economic magazines, and two books on social subjects, besides *Etudes de littérature étrangère* (1859), *Les Français en Amérique*, and works upon Canada, the United States (1873), and the English in India.

FONVIELLE, fɔ̃t'vyɛl', LOUIS EUGÈNE, Knight of (1655-1711). A French pirate, born at Thouars (in the present Department of Deux-Sèvres). He turned buccaneer in 1677, and as a chief, in command of his own vessel, cruised among the West Indies, attacking and plundering the Spaniards. He was a lieutenant in the French Navy from 1679 to 1681, when he was elected principal chief of the buccaneers, whom he continued to hold in readiness to aid the French at Santo Domingo. When the French expedition against Cartagena was organized by Baron de Pointis in 1697 he commanded 600 buccaneers in the force placed at the disposal of the expedition by Ducasse, the Governor of Santo Domingo. In 1702 he helped Ducasse to defeat a superior English fleet under Admiral John Benbow. He accompanied the unsuccessful French expedition against Rio de Janeiro in 1710, and after his surrender was treacherously murdered by the Spaniards.

FONVIELLE, WILFRID DE (1828—). A French aéronaut, meteorologist, and author. He was born at Paris, and in his early life was a teacher of mathematics. Since 1858 he has been distinguished as an aéronaut. He made numerous balloon ascents with Tissandier for meteorological purposes, and in November, 1870, during the siege of Paris, he escaped from the city in a balloon, and proceeding to London gave a series of lectures on the benefits of a republican form of government. His principal scientific works are: *L'homme fossile* (1865); *Les merveilles du monde invisible* (1866); *Eclairs et tonnerres* (1867), translated into English under the title of *Thunder and Lightning*; *L'astronomie moderne* (1868); *Histoire de la lune* (1886); and *Mort de faim* (1886). An account of the balloon ascents made by Fonvielle, Glaisher, and others appeared in French in 1870, and an English translation was published in 1871 under the title of *Travels in the Air*. In addition to the

above-mentioned works Fonvielle has written several political pamphlets, and *Aventures aériennes* (1876) and *La prévision du temps* (1879).

FOO-CHOW, fōō'chow'. See FU-CHOW.

FOOD (AS. *fōda*, Icel. *fæþi*, Goth. *fōdeins*, food; connected with Gk. *φάειν*, *pateisthai*, to feed). The articles of animal and vegetable origin that form the diet of man. Sometimes this term includes also spices, vinegar, and similar articles which, strictly speaking, are not foods, but are more properly called food accessories or condiments. A study of food and the feeding of the body, i.e. nutrition, should include knowledge of the requirements and the chemical composition of the body, the chemical composition, the laws of energy and of the metabolism of matter. Account must be taken of methods of preparing and cooking foods, of the hygiene, the comparative pecuniary value, the quantities of foods eaten, etc. Some of these subjects require investigations by specially devised methods; others are carried on by the help of physiological chemistry, bacteriology, and other related sciences. From the standpoint of nutrition, food may be defined as substance that builds tissue or yields energy when taken into the body. The most healthful food is that which is best fitted to the needs of the user; the cheapest food is that which furnishes the largest amount of nutriment at the least cost. In general, the best food is that which is both the cheapest and the most healthful.

The substances that nourish the body are very similar in chemical composition to those that compose it. They are made up of from fifteen to twenty chemical elements, the most abundant of which are oxygen, hydrogen, carbon, nitrogen, calcium, phosphorus, and sulphur. The elements are combined in a great variety of ways in the compounds of both the food and the body. Five general classes of these substances are made as follows: Water, mineral matter, protein, fats, and carbohydrates, the first two of which are called inorganic, the other three organic. In addition to material supplied in food, the body requires the oxygen of the air for the oxidation of nutrients and the production of energy.

INOORGANIC CONSTITUENTS. Water is the most abundant of the substances mentioned. It is a component part of all the tissues, and forms over 60 per cent. by weight of the body of the average man. Though very important physiologically, it neither builds tissue nor yields energy. Other food ingredients which yield little or no energy, and yet are indispensable to the body, are the mineral matters, i.e. those substances that remain as ash when body or food tissue is burned. They consist mainly of phosphate of lime or calcium phosphate, the mineral basis of bone, and numerous compounds of potassium, sodium, magnesium, and iron. They form only five or six per cent., by weight, of the body, and are found chiefly in the bones and the teeth, but are present in the other tissues and also in solution in the various fluids.

ORGANIC CONSTITUENTS. The organic compounds are so called because they occur principally in the organic, i.e. the animal and vegetable world. They all contain carbon, oxygen, and hydrogen, in varying proportions. Some also contain nitrogen, phosphorus, sulphur, or other

elements. **Protein Group.**—The protein group includes all compounds that contain nitrogen; for example, the lean and gristle of meat, the white of eggs, and the gluten of wheat. Protein forms about 18 per cent., by weight, of the body of the average man. Among the protein constituents of foods, the albuminoids, being the true tissue-formers, are the most important. Protein is the organic basis of bone, muscle, and other tissues, and is essential to the body structure. It is also used as fuel—that is, is burned in the body to yield energy—and is to some extent transformed into fat and stored in the body, but these are its less important uses. The protein compounds are most abundant in some of the animal foods, as lean meat, though the cereals contain them in considerable, and dried peas and beans in large, proportions. **Fats.**—Fats occur chiefly in animal foods, as meats, fish, butter, etc., but in considerable quantities in some cereals, notably oatmeal and maize (whole kernel), and in various nuts. They are also abundant in some vegetable products, such as olives and cottonseed, from which they are expressed as oil. In our bodies, and in those of animals, fats occur in minute particles scattered through the various tissues, and in masses under the skin, and in other localities. The amount of fat in the body varies greatly with food, exercise, age, and other conditions. When more food is taken than is necessary for immediate use, part of the surplus may be stored in the body. The protein and fat of food may thus become body protein and body fat; sugar and starch of food are changed to fat in the body and stored as such. When the food-supply is short, this reserve material is drawn upon for supplementary fuel. Fats form about 15 per cent., by weight, of the body of an average man. **Carbohydrates.**—The carbohydrates, which include such compounds as starches, different kinds of sugar, and the cellulose or fibre of plants, are found chiefly in the vegetable foods, like cereal grains and potatoes, form only a very small proportion of the body tissues—less than one per cent. Milk, however, contains considerable amounts of milk-sugar, which is a carbohydrate. Starches and sugars, which are very abundant in ordinary vegetable food materials, are important food substances, because they are easily digested, and because they form an abundant source of energy. They may be and often are transformed into fat in the body.

To a greater or less extent, the different nutrients can do one another's work. If the body has not enough of one kind of fuel, it can use another. But while protein may be burned in the body in the place of fats and carbohydrates, neither of the latter can take the place of the albuminoids in building and repairing the tissues. By being consumed themselves, however, they protect the albuminoids from consumption.

REFUSE. Food as it is bought at the market, or even as it is served on the table, contains more or less of materials—such as the bones of meat and fish, the shells of eggs, and the skins and seeds of fruits and vegetables—which we cannot or do not eat, and which would have little or no nutritive value if we did eat them. In discussing the chemical composition of foods such portions are usually counted as refuse, but they make an important item when we consider the actual cost of the nutrients of food. The mate-

rials grouped together as refuse contain, in part, the same ingredients as the edible portion, though usually in very different proportions. Thus bones are largely mineral matter, with some fat and protein; egg-shells are almost entirely mineral matter; bran of wheat has a high content of fibre or woody material.

THE BODY AS A MACHINE. Blood and muscle, bone and tendon, brain and nerve—all the organs and tissues of the body—are built from the nutritive ingredients of food. With every motion of the body, with the exercise of feeling and of thought, material is consumed and must be resupplied by food. In a sense, the body is a superior machine, and, like other machines, it requires material to build up its several parts, to repair them as they are worn out, and to serve as fuel. In some ways it uses this material like a machine; in others it does not. The steam-engine gets its power from fuel; the body does the same. In the one case, coal or wood, in the other food, is the fuel. In both cases, the energy—the potential energy—which is latent in the fuel is transformed into heat and power. When coal is burned in a furnace, part of its potential energy is transformed into the mechanical power which the engine uses for its work; the rest is wasted in the heat that the engine does not utilize. Likewise the potential energy of the food is transformed in the body into heat and mechanical power. The mechanical power is employed for muscular work. The heat is used to keep the body warm, and when more is generated than is needed for that purpose it is wasted, as in the case of the engine. However, the body is much more economical in the use of fuel than any engine. One important difference between the human machine and the steam-engine is that the

temperature. From the increase in the temperature of the water the amount of heat liberated is calculated. The unit commonly used to express the energy value of food is the calorie, i.e. the amount of heat which would raise the temperature of one kilogram of water 1° C., or, what is nearly the same thing, one pound of water 4° F. Instead of this, a unit of mechanical energy, the foot-ton, for instance, may be used. This represents the force required to raise a weight of one ton to the height of one foot. One calorie is equal to very nearly 1.54 foot-tons; that is to say, one calorie of heat, when transformed into mechanical power, would suffice to lift one ton 1.54 feet. Taking our common food materials as they are used in ordinary diet, the following general estimate has been made for the energy furnished to the body by one gram or one pound of each of the classes of nutrients:

Protein, fuel value, 4 calories per gram, or 1820 calories per pound.

Fats, fuel value, 8.9 calories per gram, or 4040 calories per pound.

Carbohydrates, fuel value, 4 calories per gram, or 1820 calories per pound.

When we compare the nutrients in respect to their fuel value—that is, their capacities for yielding heat and mechanical power—it will be seen that a pound of protein of lean meat or albumen of egg is just about equivalent to a pound of sugar or starch, and a little over two pounds of either would be required to equal a pound of the fat of meat or butter or of body fat.

What has thus far been said about the ingredients of food, and the ways they are used in the body, may be briefly summarized in the following scheme:

NUTRITIVE INGREDIENTS (OR NUTRIENTS) OF FOOD

Food as purchased contains:	{ Edible portion..... e.g. flesh of meat, yolk and white of eggs, wheat flour, etc. { Refuse. e.g. bones, entrails, shells, bran, etc.	Water.
		{ Nutrients..... { Protein. Fats. Carbohydrates. Mineral matters.

USES OF NUTRIENTS IN THE BODY

Protein..... e.g. white (albumen) of eggs, curd (casein) of milk, lean meat, gluten of wheat, etc.	Forms tissue.....	{ All serve as fuel to yield energy in the forms of heat and muscular power.
Fats..... e.g. fat of meat, butter, olive oil, oils of corn and wheat, etc.	Are stored as fat.....	
Carbohydrates..... e.g. sugar, starch, etc.	Are transformed into fat..	
Mineral matter (ash)..... e.g. phosphates of lime, potash, soda, etc.	Share in forming bone, assist in digestion, etc.	

former is self-building, self-repairing, and self-regulating. Another is that the material of which the engine is built is very different from that which it uses for fuel, but part of the material which serves the body for fuel also builds it up and keeps it in repair. Furthermore, the body can use its own substance for fuel; the steam-engine cannot.

The fuel value of food may be readily determined by burning samples in a bomb calorimeter, in an atmosphere of oxygen to secure ready and complete combustion. The heat given off passes through the walls of the bomb, and is taken up by a known volume of water of known

The following table shows the average composition of a number of the more common materials. For the composition of others, see BUTTER; EGGS; FRUIT; MEAT; MILK; CHEESE; NUTS; VEGETABLES; WHEAT; CORN; BUCKWHEAT; FIGS; etc.

DIGESTIBILITY. Not only is composition considered in valuing a food, but digestibility also. Digestibility is a term used to indicate the ease or difficulty with which a food parts with its nutrients to the body in passing through the digestive tract. The changes which food undergoes in digestion are brought about by ferments which are secreted by the digestive organs. (See

TABLE I.—AVERAGE COMPOSITION OF SOME COMMON AMERICAN FOOD PRODUCTS

FOOD MATERIALS (AS PURCHASED)	Refuse	Water	Protein	Fat	Carbo- hydrates	Ash	Fuel value per pound
ANIMAL FOOD							
	Perct.	Perct.	Perct.	Perct.	Perct.	Perct.	Calories
Beef, fresh:							
Chuck ribs.....	16.3	52.6	15.5	15.0	.....	0.8	910
Porterhouse steak.....	12.7	52.4	19.1	17.9	.....	.8	1,100
Sirloin steak.....	12.8	54.0	16.5	16.1	.....	.9	975
Round.....	7.2	60.7	19.0	12.8	.....	1.0	890
Rump.....	20.7	45.0	13.8	20.2	.....	.7	1,090
Shank, fore.....	36.9	42.9	12.8	7.3	.....	.6	545
Beef, corned, canned, pickled, and dried:							
Corned beef.....	8.4	49.2	14.3	23.8	.....	4.6	1,245
Dried, salted, and smoked.....	4.7	53.7	26.4	6.9	.....	8.9	790
Canned corned beef.....	.....	51.8	26.3	18.7	.....	4.0	1,270
Veal:							
Breast.....	21.3	52.0	15.4	11.0	.....	.8	745
Leg.....	14.2	60.1	15.5	7.9	.....	.9	625
Leg cutlets.....	3.4	68.3	20.1	7.5	.....	1.0	695
Mutton:							
Flank.....	9.9	39.0	13.8	36.9	.....	.6	1,770
Leg, hind.....	18.4	51.2	15.1	14.7	.....	.8	890
Loin chops.....	16.0	42.0	13.5	28.3	.....	.7	1,415
Lamb:							
Breast.....	19.1	45.5	15.4	19.1	.....	.8	1,075
Leg, hind.....	17.4	52.9	15.9	13.6	.....	.9	860
Pork, fresh:							
Ham.....	10.7	48.0	13.5	25.9	.....	.8	1,390
Loin chops.....	19.7	41.8	13.4	24.2	.....	.8	1,245
Shoulder.....	12.4	44.9	12.0	29.8	.....	.7	1,450
Tenderloin.....	.....	66.5	18.9	13.0	.....	1.0	895
Pork, salted, cured, and pickled:							
Ham, smoked.....	13.6	34.8	14.2	33.4	.....	4.2	1,635
Shoulder, smoked.....	18.2	36.8	13.0	26.6	.....	5.5	1,335
Salt pork.....	.....	7.9	1.9	86.2	.....	3.9	3,555
Bacon, smoked.....	7.7	17.4	9.1	62.2	.....	4.1	2,715
Soups:							
Celery, cream of.....	.....	88.6	2.1	2.8	5.0	1.5	235
Beef.....	.....	92.9	4.4	.4	1.1	1.2	120
Meat stew.....	.....	84.5	4.6	4.3	5.5	1.1	365
Tomato.....	.....	90.0	1.8	1.1	5.6	1.5	185
Poultry:							
Chicken, broilers.....	41.6	43.7	12.8	1.4	.....	.7	305
Fowls.....	25.9	47.1	13.7	12.3	.....	.7	765
Goose.....	17.6	38.5	13.4	29.8	.....	.7	1,475
Turkey.....	22.7	42.4	16.1	18.4	.....	.8	1,060
Fish:							
Cod, dressed.....	29.9	58.5	11.1	.2	.....	.8	220
Halibut, steaks or sections.....	17.7	61.9	15.3	4.4	.....	.9	475
Mackerel, whole.....	44.7	40.4	10.2	4.2	.....	.7	370
Perch, yellow dressed.....	35.1	50.7	12.8	.7	.....	.9	275
Shad, whole.....	50.1	35.2	9.4	4.8	.....	.7	380
Shad, roe.....	.....	71.2	20.9	3.8	2.6	1.5	600
Fish, preserved:							
Cod, salt.....	24.9	40.2	18.0	.4	.....	18.5	325
Herring, smoked.....	44.4	19.2	20.5	8.8	.....	7.4	755
Fish, canned:							
Salmon.....	.....	63.5	21.8	12.1	.....	2.6	915
Sardines.....	*5.0	53.6	23.7	12.1	.....	5.3	950
Shellfish:							
Oysters, 'solids'.....	.....	88.3	6.0	1.3	3.3	1.1	225
Clams.....	.....	80.8	10.6	1.1	5.2	2.3	340
Crabs.....	62.4	36.7	7.9	.9	.6	1.5	200
Lobsters.....	61.7	30.7	5.9	.7	.2	.8	145
Eggs: Hens' eggs.....	†11.2	65.5	13.1	9.3	.....	.9	635
Dairy products, etc.:							
Butter.....	.....	11.0	1.0	85.0	.....	3.0	3,410
Whole milk.....	.....	87.0	3.3	4.0	5.0	.7	310
Skim milk.....	.....	90.5	3.4	.3	5.1	.7	165
Buttermilk.....	.....	91.0	3.0	.5	4.8	.7	160
Condensed milk.....	.....	26.9	8.8	18.3	54.1	1.9	1,430
Cream.....	.....	74.0	2.6	18.5	4.5	.5	865
Cheese, Cheddar.....	.....	27.4	27.7	36.8	4.1	4.0	2,075
Cheese, full cream.....	.....	34.2	25.9	33.7	2.4	3.8	1,885
VEGETABLE FOOD							
Flour, meal, etc.:							
Entire-wheat flour.....	.....	11.4	13.8	1.9	71.9	1.0	1,650
Graham flour.....	.....	11.3	13.3	2.2	71.4	1.8	1,645
Wheat flour, patent roller process:							
High-grade and medium.....	.....	12.0	11.4	1.0	75.1	.5	1,635
Low-grade.....	.....	12.0	14.0	1.9	71.2	.9	1,640
Macaroni, vermicelli, etc.....	.....	10.3	13.4	.9	74.1	1.3	1,645
Wheat breakfast food.....	.....	9.6	12.1	1.8	75.2	1.3	1,680
Buckwheat flour.....	.....	13.6	6.4	1.2	77.9	.9	1,605
Rye flour.....	.....	12.9	6.8	0.9	78.7	.7	1,620
Corn meal.....	.....	12.5	9.2	1.9	75.4	1.0	1,635
Oat breakfast food.....	.....	7.7	16.7	7.3	66.2	2.1	1,800
Rice.....	.....	12.3	8.0	.3	79.0	.4	1,620
Tapioca.....	.....	11.4	.4	.1	88.0	.1	1,650
Starch.....	.....	.....	.....	.....	90.0	.....	1,675

* Refuse, including oil.

† Refuse, shell.

FOOD MATERIALS (AS PURCHASED)	Refuse	Water	Protein	Fat	Carbo- hydrates	Ash	Fuel value per pound
VEGETABLE FOOD—CONTINUED	Perct.	Perct.	Perct.	Perct.	Perct.	Perct.	Calories
Bread, pastry, etc.:							
White bread.....	35.3	9.2	1.3	53.1	1.1	1,200	
Brown bread.....	43.6	5.4	1.8	47.1	2.1	1,040	
Graham bread.....	35.7	8.9	1.8	52.1	1.5	1,195	
Whole-wheat bread.....	38.4	9.7	.9	49.7	1.3	1,130	
Rye bread.....	35.7	9.0	.6	53.2	1.5	1,170	
Sugars, etc.:							
Molasses.....				70.0		1,225	
Candy.....				96.0		1,680	
Honey.....				81.0		1,420	
Sugar, granulated.....				100.0		1,750	
Maple sirup.....				71.4		1,250	
Vegetables: †							
Beans, dried.....	12.6	22.5	1.8	59.6	3.5	1,520	
Beans, Lima, shelled.....	68.5	7.1	.7	22.0	1.7	540	
Beans, string.....	7.0	83.0	2.1	.3	6.9	.7	170
Beets.....	20.0	70.0	1.3	.1	7.7	.9	160
Cabbage.....	15.0	77.7	1.4	.2	4.8	.9	115
Celery.....	20.0	75.6	.9	1.1	2.6	.8	65
Corn, green (sweet), edible portion.....	75.4	3.1	1.1	19.7	.7	440	
Cucumbers.....	15.0	81.1	.7	.2	2.6	.8	65
Lettuce.....	15.0	80.5	1.0	.2	2.5	.8	65
Onions.....	10.0	78.9	1.4	.3	8.9	.5	190
Parsnips.....	20.0	66.4	1.3	.4	10.8	1.1	230
Peas (<i>Pisum sativum</i>) dried.....	9.5	24.6	1.0	62.0	2.9	1,565	
Peas (<i>Pisum sativum</i>), shelled.....	74.6	7.0	.5	16.9	1.0	440	
Cowpeas, dried.....	13.0	21.4	1.4	60.8	3.4	1,505	
Potatoes.....	20.0	62.6	1.8	.1	14.7	.8	295
Rhubarb.....	40.0	55.6	.4	.4	2.2	.4	60
Sweet potatoes.....	20.0	55.2	1.4	.6	21.9	.9	440
Spinach.....		92.3	2.1	.3	3.2	2.1	95
Squash.....	50.0	44.2	.7	.2	4.5	.4	100
Tomatoes.....		94.3	.9	.4	3.9	.5	100
Turnips.....	30.0	62.7	.9	.1	5.7	.6	120
Vegetables, canned:							
Baked beans.....		68.9	6.9	2.5	19.6	2.1	555
Peas (<i>Pisum sativum</i>), green.....		85.3	3.6	.2	9.8	1.1	235
Corn, green.....		76.1	2.8	1.2	19.0	.9	430
Succotash.....		75.9	3.6	1.0	18.6	.9	425
Tomatoes.....		94.0	1.2	.2	4.0	.6	95
Fruits, berries, etc., fresh ‡							
Apples.....	25.0	63.3	.3	.3	10.8	.3	190
Bananas.....	35.0	48.9	.8	.4	14.3	.6	260
Grapes.....	25.0	58.0	1.0	1.2	14.4	.4	295
Oranges.....	27.0	63.4	.6	.1	8.5	.4	150
Pears.....	10.0	76.0	.5	.4	12.7	.4	230
Raspberries.....		85.8	1.0		12.6	.6	220
Strawberries.....	5.0	85.9	.9	.6	7.0	.6	150
Fruits, dried:							
Apples.....		28.1	1.6	2.2	66.1	2.0	1,185
Apricots.....		29.4	4.7	1.0	62.5	2.4	1,125
Dates.....	10.0	13.8	1.9	2.5	70.6	1.2	1,275
Figs.....		18.8	4.3	.3	74.2	2.4	1,280
Raisins.....	10.0	13.1	2.3	3.0	68.5	8.1	1,265
Nuts:							
Almonds.....	45.0	2.7	11.5	30.2	9.5	1.1	1,515
Chestnuts, fresh.....	16.0	37.8	5.2	4.5	35.4	1.1	915
Cocanuts.....	48.8	7.2	2.9	25.9	14.3	.9	1,295
Hickory nuts.....	62.2	1.4	5.8	25.5	4.3	.8	1,145
Pecans, polished.....	53.2	1.4	5.2	33.3	6.2	.7	1,465
Peanuts.....	24.5	6.9	19.5	29.1	18.5	1.5	1,775
Walnuts, black.....	74.1	.6	7.2	14.6	3.0	.5	730
Walnuts, English.....	58.1	1.0	6.9	26.6	6.8	.6	1,250
Miscellaneous:							
Chocolate.....		5.9	12.9	48.7	30.3	2.2	5,625
Cocoa, powdered.....		4.6	21.6	28.9	37.7	7.2	2,160
Cereal coffee, infusion (1 part boiled in 20 parts water) §.....		98.2	.2		1.4	.2	30

* Plain confectionery not containing nuts, fruit, or chocolate.

† Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skin, seeds, etc. The amount varies with the method of preparing the vegetables, and cannot be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

‡ Fruits contain a certain proportion of inedible materials, as skin, seeds, etc., which are properly classed as refuse. In some fruits, as oranges and prunes, the amount rejected in eating is practically the same as refuse. In others, as apples and pears, more or less of the edible material is ordinarily rejected with the skin and seeds and other inedible portions. The edible material which is thus thrown away, and should properly be classed with the waste, is here classed with the refuse. The figures for refuse here given represent, as nearly as can be ascertained, the quantities ordinarily rejected.

§ Milk and shell.

¶ The average of five analyses of cereal coffee grain is: Water 6.2, protein 13.3, fat 3.4, carbohydrates 72.6, and ash 4.5 per cent. Only a portion of the nutrients, however, enter into the infusion. The average in the table represents the available nutrients in the beverage. Infusions of genuine coffee and of tea like the above contain practically no nutrients.

ALIMENTARY SYSTEM; DIGESTION, ORGANS OF.) The ptyalin of saliva in the mouth changes insoluble starches into sugar. The food does not remain in the mouth for a long time, but never-

it has been calculated that on an average the different groups into which food may for convenience be divided have the following coefficients of digestibility and fuel value per pound:

TABLE II.—COEFFICIENTS OF DIGESTIBILITY AND FUEL VALUE PER POUND OF NUTRIENTS IN DIFFERENT GROUPS OF FOOD MATERIALS

KIND OF FOOD	Protein		Fat		Carbohydrates	
	Digestibility	Fuel value per pound	Digestibility	Fuel value per pound	Digestibility	Fuel value per pound
	Per cent.	Calories	Per cent.	Calories	Per cent.	Calories
Meats and fish.....	97	1,940	95	4,040	98	1,730
Eggs.....	97	1,980	95	4,090	98	1,730
Dairy products.....	97	1,940	95	3,990	98	1,730
Animal food (of mixed diet).....	97	1,940	95	4,050	98	1,730
Cereals.....	85	1,750	90	3,800	98	1,860
Legumes (dried).....	78	1,570	90	3,800	97	1,840
Sugars.....	...	.....	.....	.....	98	1,750
Starches.....	...	.....	.....	.....	98	1,860
Vegetables.....	83	1,410	90	3,800	95	1,800
Fruits.....	85	1,520	90	3,800	90	1,630
Vegetable foods (of mixed diet).....	84	1,840	90	3,800	97	1,820
Total food (of mixed diet).....	92	1,820	95	4,050	97	1,820

theless the action of the saliva is considerable. Saliva also helps to prepare the food for the stomach by moistening it and making its texture such that the gastric juices of the stomach may readily act upon it. The gastric juice acts upon protein, the pancreatic juice of the intestine (see PANCREAS) upon protein, fat, and carbohydrates. All the digestive juices are assisted by a fine division of the food in chewing and by muscular contractions, called the peristaltic action of the stomach and intestine. These latter motions help to mix the digestive juices and their ferments with the food. The otherwise insoluble nutrients of food are rendered soluble by digestion. The digested food finds its way through the walls of the alimentary canal, and in this passage and later undergoes remarkable changes. When finally the blood, supplied with nutrients of the digested food and laden with the oxygen from the lungs, is propelled from the heart all over the body, it is ready to furnish the organs and tissues with the materials and energy needed for the various functions. At the same time it carries away the waste which the exercise of these functions has produced. The living body tissue has the power of choosing the necessary materials from the blood and building them into its own structure. Just how this is done cannot be explained. That portion of the food which the digestive juices cannot dissolve, or which for some reason escapes digestion, is periodically excreted as *fæces*. This material includes not only indigestible material and particles of undigested food, but also the so-called metabolic products, i.e. residues of the digestive juices, bits of the lining of the alimentary canal, etc. For discussions of other excretory products, see URINE; SWEAT; RESPIRATION, ORGANS OF.

The digestibility of any food may be learned most satisfactorily by experiments with man, although experiments are also made by methods of artificial digestion. In the experiments with man both food and *fæces* are analyzed. Deducting the amounts of the several nutrients in the *fæces* from the total amounts of each nutrient consumed shows how much of each was digested. The results are usually expressed in percentages, and spoken of as coefficients of digestibility. From a large number of experiments with man

By the aid of these factors and the figures for the composition of food, the digestible nutrients in different materials may be calculated, as has been done in Table III. In making the calculations the further assumption is made that 75 per cent. of the ash is digestible.

As a general rule, carbohydrates are more completely digested than protein and fats, and hence are more fully available for use in the body; and protein of animal foods, as meat, fish, milk, and eggs, is more digestible than that of vegetable foods. Fats are probably less digestible than most forms of protein and carbohydrates. Other things being equal, foods furnishing nutrients which can be most easily and completely utilized by the body are the most desirable, since they will not bring unnecessary exertion to the various organs. Many kinds of food which in their natural state hold the most valuable nutrients in such form that the digestive juices cannot easily work upon them are so changed by the heat of cooking that they become easily digestible. Thus the importance of proper cooking can hardly be overestimated. Things which please the palate stimulate the flow of the digestive juices; for this reason food should be made appetizing. An attractive diet pleases the æsthetic sense; hence refinement in food habits is as desirable as in other phases of our daily life. The sense of comfort and satisfaction produced by even the appearance of food well cooked and served is of indisputable value. Fortunately such satisfaction is within the reach of almost all.

EASE AND QUICKNESS OF DIGESTION. The terms digestible, indigestible, etc., as used above, refer simply to the food which is or is not available for the general nourishment of the body after the process of digestion is completed. In common parlance, however, they are used more loosely as referring to the ease and quickness of digestion, and to the general wholesomeness of food. One kind of food, bread, for instance, is spoken of as 'simple' and 'digestible,' and another, like fruit cake, as 'rich' and 'indigestible.' There is often much practical truth behind such statements, though little is definitely known concerning the time or labor required to digest different kinds of food. Food does not ordinarily

TABLE III.—DIGESTIBLE NUTRIENTS AND AVAILABLE ENERGY OF SOME COMMON FOODS

KIND OF FOOD MATERIALS	Refuse	Water	Total indigestible nutrients	Digestible nutrients				Fuel value per pound
				Protein	Fat	Carbohy- drates	Ash	
ANIMAL FOOD	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Calories</i>
Beef, fresh:								
Chuck, ribs.....	16.3	52.6	1.4	15.0	14.3	.....	0.6	910
Loin, medium.....	13.3	52.5	1.6	15.6	16.6	.....	.7	1,025
Ribs.....	20.8	48.8	1.8	13.5	20.0	.....	.5	1,135
Round, medium.....	7.2	60.7	1.4	18.4	12.2	.....	.8	890
Shoulder and clod.....	16.4	56.8	1.2	15.9	9.3	.....	.7	715
Beef, dried and smoked.....	4.7	53.7	4.5	25.6	6.6	.....	5.5	790
Veal:								
Cutlets, round.....	3.4	68.3	1.2	19.5	7.1	.....	.8	695
Leg.....	14.2	60.1	1.1	15.0	7.5	.....	.7	625
Mutton:								
Leg.....	18.4	51.2	1.4	14.6	14.0	.....	.6	890
Loin.....	16.0	42.0	2.0	13.1	26.9	.....	.5	1,415
Pork, fresh:								
Loin, chop.....	19.7	41.8	1.8	13.0	23.0	.....	.6	1,245
Ham.....	10.7	48.0	1.9	13.1	24.6	.....	.6	1,390
Pork, salted and smoked:								
Bacon.....	7.7	17.4	4.4	8.8	59.1	.....	3.1	2,720
Ham.....	13.6	34.8	3.1	13.8	31.7	.....	3.2	1,635
Salt, fat.....	.....	7.9	5.4	1.8	81.9	.....	2.9	3,555
Poultry:								
Fowl.....	25.9	47.1	1.2	13.3	11.7	.....	.5	765
Turkey.....	22.7	42.4	1.6	15.6	17.5	.....	.6	1,060
Fish, fresh:								
Cod, dressed.....	29.9	58.5	.5	10.8	.2	.....	.6	220
Mackerel.....	44.7	40.4	.7	9.9	4.0	.....	.5	370
Shellfish:								
Oysters, solids.....	.....	88.3	.6	5.8	1.2	3.3	.8	225
Fish, preserved and canned:								
Cod, salt.....	24.9	40.2	5.1	15.5	.4	.....	13.9	325
Salmon, canned.....	.....	63.5	1.9	21.1	11.5	.....	2.0	915
Eggs, uncooked.....	11.2	65.5	1.1	12.7	8.8	.....	.7	635
Dairy products:								
Whole milk.....	.....	87.0	.5	3.2	8.8	5.0	.5	310
Skim milk.....	.....	90.5	.3	3.3	.3	5.1	.5	165
Cream.....	.....	74.0	1.1	2.4	17.6	4.5	.4	865
Butter.....	.....	11.0	4.9	1.0	80.8	.....	2.3	3,410
VEGETABLE FOOD								
Cereals, etc.:								
Corn meal.....	.....	12.5	3.3	7.8	1.7	73.9	.8	1,640
Oat breakfast food.....	.....	7.8	5.1	14.2	6.6	64.9	1.4	1,800
Rye flour.....	.....	12.9	2.9	5.8	.8	77.1	.5	1,620
Rice.....	.....	12.3	2.9	6.8	.3	77.4	.3	1,625
Wheat flour, patent process.....	.....	12.0	3.4	9.7	.9	73.6	.4	1,635
Wheat breakfast food.....	.....	8.6	3.8	10.3	1.6	73.7	1.0	1,680
Bread, etc.:								
Bread, white wheat.....	.....	35.3	2.9	7.8	1.2	52.0	.8	1,200
Crackers, cream.....	.....	9.8	4.5	8.2	10.9	68.3	1.3	1,925
Vegetables:								
Beans, white, dried.....	.....	12.6	7.9	17.5	1.6	57.8	2.6	1,520
Beets, fresh.....	20.0	70.0	.6	1.1	.1	7.3	.7	160
Cabbage.....	15.0	77.7	.8	1.2	.2	4.6	.7	115
Potatoes.....	20.0	62.6	1.2	1.5	.1	14.0	.6	295
Squash.....	50.0	44.2	.4	.6	.2	4.3	.3	100
Sweet potatoes, fresh.....	20.0	55.2	1.6	1.2	.5	20.8	.7	440
Tomatoes.....	.....	94.3	.5	.7	.4	3.7	.4	95
Fruits:								
Apples.....	25.0	63.3	1.2	.3	.3	9.7	.2	190
Bananas.....	35.0	48.9	1.6	.7	.4	12.9	.5	260
Grapes.....	25.0	58.0	1.7	.9	1.1	13.0	.3	295
Oranges.....	27.0	63.4	1.0	.5	.1	7.7	.3	150
Strawberries.....	5.0	85.9	1.0	.8	.5	6.3	.5	150

pass from the stomach into the intestine until it has been reduced to a liquid or semi-liquid condition. The length of time required for different foods to leave the stomach has recently been studied by Penzoldt, among others, with healthy men. He found that the amount and consistency of food have a marked influence on the rate of digestion in the stomach. According to his investigations, fluids leave the stomach more rapidly than other materials. Hot drinks do not leave the stomach more quickly than cold ones, nor does the quantity have much effect. Solid matter in solution or suspension delays the passage of fluid from the stomach somewhat. The consistency of solid foods thus seems to have more effect upon digestibility than the amount consumed. The quantity eaten increases the

length of time the material remains in the stomach, but not proportionally.

To select a few examples of the time required for foods to leave the stomach: Two eggs (raw, poached, or in the form of an omelet), seven ounces of sweetbreads, ten moderate-sized oysters, seven ounces of white fish or three and one-half ounces of white bread, cauliflowers, or cherries, each required two to three hours to digest. Eight and one-fourth ounces of chicken, nine ounces of lean beef, six ounces of boiled ham, three and one-half ounces of roast veal or beefsteak, five and one-third ounces of coarse bread, boiled rice, carrots, spinach, radish, or apple, left the stomach in three to four hours. Nine ounces of smoked tongue, three and one-half ounces of smoked beef, nine ounces of roast goose, five and

one-third ounces of string-beans, or seven ounces of pease porridge, left the stomach in four to five hours.

Generally speaking, the most readily digested animal foods were materials of soft consistency. White meats—for example, chicken—leave the stomach more quickly than red meats or dark meats—for instance, duck. The method of cooking also exerts a very marked influence on stomach digestion. Fresh fish was found to be more readily digested than meats. As regards vegetable foods in general, the consistency and the amounts of solid material were again the principal factors affecting the time required for digestion in the stomach. Mealy potatoes, for instance, were more easily digested than waxy potatoes, and mashed potato more readily than potato cut up in pieces. Fine bread was more quickly digested than coarse bread. There was not much difference in the time required for bread-crust, bread-crumbs, toast, new bread, and stale bread to digest in the stomach, provided all were equally well chewed.

It must be remembered that digestion continues in the intestine, and that the total time required for the digestion and absorption of the nutrients in any given food material is not shown by such experiments as those just mentioned. They find their chief application in prescribing a diet for invalids, as in such cases it is often desirable to require of the stomach only a limited amount of work.

AGREEMENT OF FOOD WITH INDIVIDUALS. Digestibility is often confused with another very different thing, namely, the agreeing or disagreeing of food with the person who eats it. Different persons are differently constituted with respect to the chemical changes which their food undergoes and the effect produced, so that it may be literally true that 'one man's meat is another man's poison.' Milk is for most people a very wholesome, digestible, and nutritious food, but there are persons who are made ill by drinking it. They should avoid it. Some persons have to avoid strawberries. Indeed, cases in which the most wholesome kinds of food are hurtful to individual persons are, unfortunately, numerous. Every man must learn from his own experience what food agrees with him and what does not.

How much harm is done by the injurious compounds sometimes formed in the body from ordinarily wholesome foods is seldom realized. Physiological chemistry is revealing the fact that these compounds may affect even the brain and nerves, and that some forms of insanity are caused by products formed by the abnormal transformations of food and body material.

METABOLISM EXPERIMENTS. As already stated, a knowledge of food and its uses in the body is obtained from studies of composition, digestibility, etc., and from complicated experiments, in some of which the balance of income and outgo of matter and energy is studied. The latter are called metabolism experiments, the balance of matter being measured in terms of nitrogen, or of nitrogen and carbon, and sometimes other elements also, and the balance of energy being measured in terms of heat. In determining the balance of income and outgo of nitrogen, special attention is paid to the amounts of this constituent in food, urine, and feces. When the balance of carbon is also taken into account, a res-

piration apparatus is very convenient and almost necessary. This apparatus permits of the measurement and analysis of the respiratory products, since these contain a large part of the carbon (as carbon dioxide) excreted from the body. Various forms of respiration apparatus have been devised within the last fifty years, among the most important being those invented by Pettenkofer and Voit, in Munich. They consist of metal-walled chambers, large enough for the subject (sometimes a man, sometimes a dog, sheep, or other animal) to live in comfortably for several days, and are furnished with devices for pumping air through, and measuring and analyzing it as it enters and as it leaves the chamber. With such an apparatus it is possible not only to measure all the food and excreta, but also the materials given off from the lungs in the breath, and to make accurate determination of the matter entering and leaving the body. A still more elaborate apparatus, by which not only all the matter passing in and out of the body may be measured, but also all the heat given off from it, is called a respiration calorimeter—that is, a machine for measuring both the respiratory products and the heat given off by the body. It is like the respiration apparatus, except that it is furnished with devices for measuring temperatures. Several have been built, the majority in Europe, within the last twenty years, among the most successful being those by Professor Rubner and Professor Rosenthal, in Germany, and that devised by Professors Atwater and Rosa in the United States. The latter form, which represents a great advance on any previously devised, was elaborated at Wesleyan University in connection with the nutrition investigations carried on under the auspices of the Office of Experiment Stations of the United States Department of Agriculture. Its main feature is a copper-walled chamber, seven feet long, four feet wide, and six feet four inches high. This is fitted with devices for maintaining and measuring a ventilating current of air, for sampling and analyzing this air, for removing and measuring the heat given off within the chamber, and for passing food and other articles. It is furnished with a folding bed, chair, and table, with scales and with appliances for muscular work, and has a telephone connection with the outside. Here the subject stays for a period of from three to twelve days, during which time careful analyses and measurements are made of all material which enters the body in the food, and of that which leaves it in the breath and excreta. Record is kept of the energy given off from the body as heat and muscular work. The difference between the material taken into and that given off from the body is called the balance of matter, and shows whether the body is gaining or losing material. The difference between the energy of the food taken and that of the excreta and the energy given off from the body as heat and muscular work is the balance of energy, and if correctly estimated should equal the energy of the body material gained or lost. With such apparatus it is possible to learn much of the real nutritive value of foods, and what effect different conditions of nourishment will have on the human body. In one experiment, for instance, the subject might be kept quite at rest, and in another do a certain amount of muscular or mental work, with the same diet as before. Then by comparing the results of the two the use

which the body makes of its food under the different conditions could be determined. Or the diet might be slightly changed in one experiment, and the effect of this on the balance of matter and energy observed. Such methods and apparatus are very costly in time and money, but the results are proportionately more valuable than those from simpler experiments.

DIETARIES AND DIETARY STANDARDS. The information gained from a study of the composition and nutritive value of foods may be turned to practical account by using it in planning diets for different individuals or classes of individuals, or in estimating the true nutritive value of the food actually consumed by families or individuals. By comparing the results of many such

investigations with the results of accurate physiological experimenting it is possible to learn about how much of each of the nutrients of common foods is needed by persons of different occupations and habits of life, and from this to compute standards representing the average requirements for food of such persons. The plan followed in making dietary studies is, briefly, as follows: Exact account is taken of all the food materials (1) on hand at the beginning of the study, (2) procured during the study, and (3) remaining at the end. The difference between the third and the sum of the first and second is taken as representing the amounts used. From the figures thus obtained the amount of the different food materials and the amount of the dif-

TABLE IV.—FOOD CONSUMPTION OF PERSONS IN DIFFERENT CIRCUMSTANCES, AND PROPOSED DIETARY STANDARDS
[Quantities per man per day]

SUBJECTS	Number of cases included in averages	Actually eaten			Digestible			Fuel value
		Protein	Fat	Carbohydrates	Protein	Fat	Carbohydrates	
		Gms.	Gms.	Gms.	Gms.	Gms.	Gms.	Calories
PERSONS WITH ACTIVE WORK								
Rowing clubs in New England.....	7	155	177	440	143	168	427	3,955
Bicyclists in New York.....	3	186	186	651	171	177	631	5,005
Football teams in Connecticut and California.....	2	226	354	634	208	336	615	6,590
Prussian machinist.....	1	139	113	677	128	107	657	4,270
Swedish mechanics.....	5	189	110	714	174	104	693	4,590
PERSONS WITH ORDINARY WORK								
Farmers' families in Eastern United States.....	10	97	130	467	89	124	453	3,415
Mechanics' families in United States.....	14	103	150	402	95	143	390	3,355
Laborers' families in large cities of United States.....	12	101	116	344	93	110	334	2,810
Laborers' families in United States (more comfortable circumstances).....	2	120	147	534	110	140	518	3,925
Russian peasants.....	.....	129	33	589	119	31	571	3,165
Swedish mechanics.....	6	134	79	523	123	75	507	3,330
PROFESSIONAL MEN								
Lawyers, teachers, etc., in United States.....	14	104	125	423	96	119	410	3,220
College clubs in United States.....	15	107	148	459	98	141	445	3,580
German physicians.....	2	131	95	327	121	90	317	2,680
Japanese professor.....	1	123	21	416	113	19	403	2,345
MEN WITH LITTLE OR NO EXERCISE								
Men (American) in respiration calorimeter.....	11	112	80	305	103	76	296	2,380
Men (German) in respiration apparatus.....	5	127	80	302	117	76	293	2,430
PERSONS IN DESTITUTE CIRCUMSTANCES								
Poor families in New York City.....	11	93	95	407	86	90	395	2,845
Laborers' families in Pittsburgh, Pa.....	2	80	95	308	74	90	299	2,400
German laborer's family.....	1	52	32	287	48	30	278	1,640
Italian mechanics.....	5	76	38	396	70	36	384	2,225
MISCELLANEOUS								
Negro families in Alabama and Virginia.....	39	86	145	440	79	138	427	3,395
Italian families in Chicago.....	4	103	111	391	95	105	379	2,965
French Canadians in Chicago.....	5	118	158	345	109	150	335	3,260
Bohemian families in Chicago.....	8	115	101	360	106	96	349	2,800
Inhabitants Java village, Columbian Exposition, 1893.....	1	66	19	254	61	18	246	1,450
Russian Jews in Chicago.....	10	137	103	418	126	98	405	3,135
Mexican families in New Mexico.....	4	94	71	613	86	67	595	3,460
Chinese dentist in California.....	1	115	113	289	106	107	280	2,620
Chinese laundryman in California.....	1	135	76	566	124	72	549	3,480
Chinese farm laborer in California.....	1	144	95	640	132	90	621	3,980
United States army ration, peace.....	.....	120	161	454	110	153	440	3,730
German army ration, peace.....	.....	114	39	480	105	37	466	2,725
DIETARY STANDARDS								
Man at hard work (Voit).....	.....	145	100	450	133	95	437	3,270
Man at moderate work (Voit).....	.....	118	56	500	109	53	485	2,965
Man with very hard muscular work (Atwater).....	.....	175	(*)	(*)	161	(*)	(*)	5,500
Man with hard muscular work (Atwater).....	.....	150	(*)	(*)	138	(*)	(*)	4,150
Man with moderately active muscular work (Atwater).....	.....	125	(*)	(*)	115	(*)	(*)	3,400
Man with light to moderate muscular work (Atwater).....	.....	112	(*)	(*)	103	(*)	(*)	3,050
Man at 'sedentary' or woman with moderately active work (Atwater).....	.....	100	(*)	(*)	92	(*)	(*)	2,700
Woman at light to moderate muscular work, or man without muscular exercise (Atwater).....	.....	90	(*)	(*)	83	(*)	(*)	2,450

* Fats and carbohydrates in sufficient amounts to furnish, together with the protein, the indicated amount of energy.

ferent nutrients furnished by them is calculated. Deducting from this the weights of the nutrients found in the kitchen and table refuse, the amounts actually consumed are obtained. Account is also taken of the meals eaten by different members of the family or groups studied and by visitors, if there are any. From the total food eaten by all the persons during the entire period the amount eaten per man per day may be calculated. In making these calculations due account is taken of the fact that women and children eat less than men performing the same amount of work. The various factors commonly used in the United States in computing the results of dietary studies are as follows:

FACTORS USED IN CALCULATING MEALS CONSUMED IN DIETARY STUDIES.

Man at hard muscular work requires 1.2 the food of a man at moderately active muscular work.

Man with light muscular work and boy 15-16 years old require 0.9 the food of a man at moderately active muscular work.

Man at sedentary occupation, woman at moderately active work, boy 13-14, and girl 15-16 years old require 0.8 the food of a man at moderately active muscular work.

Woman at light work, boy 12, and girl 13-14 years old require 0.7 the food of a man at moderately active muscular work.

Boy 10-11 and girl 10-12 years old require 0.6 the food of a man at moderately active muscular work.

Child 6-9 years old requires 0.5 the food of a man at moderately active muscular work.

Child 2-5 years old requires 0.4 the food of a man at moderately active muscular work.

Child under 2 years old requires 0.3 the food of a man at moderately active muscular work.

These factors are based in part upon experimental data, and in part upon arbitrary assumptions. They are subject to revision when experimental evidence shall warrant more definite conclusions.

The preceding table shows the average results of a large number of dietary studies made in the United States and other countries with persons performing different amounts of muscular work and living under different conditions. Using such factors as those referred to above, the digestible nutrients furnished by the diet have also been calculated.

As will be seen, the American dietary standards express the food requirements in terms of protein and energy only. This is done because of simplicity, and is permissible, since, theoretically at least, the proportion of fats and carbohydrates is immaterial, provided both are present and in such quantity that the total energy supplied is sufficient. As the habits and conditions of individuals differ, so, too, their needs for nourishment differ, and their food should be adapted to their particular requirements. Climate and other circumstances influence the character of the food consumed, and doubtless in large degree the quantity also. However, the amount of nutrients is determined, generally speaking, by the age, size of the body, and especially by the amount of work performed, increasing or decreasing according as the amount of work is greater or less. It is not necessary that the food each day equal exactly the amount called for by the dietary standards. A deficiency one day is made good by an excess the next, and *vice versa*. It is believed, however, that persons are best nourished when through long periods the diet furnishes approximately the nutrients and energy which the standard calls for. What has been said applies to persons in health and under more or less normal conditions; the diet of the

sick, convalescent, etc., is a subject which pertains to the practice of medicine.

To learn whether any given diet conforms to the standard, the amount of nutrients and energy (or, what serves the same purpose, protein and energy) must be ascertained. To this end the weight of the different food materials provided for the day's diet must be ascertained, as well as the composition of each of the food materials. This may be readily calculated from the tables of percentage composition. The total protein and total energy is, of course, learned by adding together the amounts furnished by the different food materials. The amount per man per day can then be learned by dividing the total amounts by the number of persons served. If the diet be deficient in protein or in energy, food materials should be added which supply protein or are especially valuable as sources of energy (i.e. foods rich in fats and carbohydrates). If more protein or energy be provided than the standard demands, the food materials should be correspondingly diminished. In ordinary mixed diet, which seems to be the one best suited to man in health, the chief sources of protein are meat, fish, and milk, among animal foods, and the cereals and legumes among vegetable foods. Beans, peas, and oatmeal are rich in protein, and hence are especially valuable food. About nine-tenths of the fat in the ordinary diet is obtained from the animal foods, while the vegetable foods furnish approximately nine-tenths of the carbohydrates.

Too much food is as bad as too little, and occasions a waste of energy and strength in the body, as well as a waste of nutritive material.

Among people who have the benefits of modern comfort and culture the palate revolts against a very simple and unvaried diet, and for this reason the nutrients are usually supplied from a variety of articles—some of animal, some of vegetable origin. With a varied diet it is also easier to secure the proper proportions of protein to fats and carbohydrates.

PREPARATION OF FOOD—COOKING. The cooking of food has much to do with its nutritive value. Many articles which, owing to their physical condition or other cause, are quite unfit for nourishment when raw are very nutritious when cooked. It is also a matter of common experience that a well-cooked food is wholesome and appetizing, while the same material badly cooked is unpalatable. There are three chief purposes of cooking. The first is to change the physical condition so that the digestive juices can act upon the food more freely. Heating often changes the structure of food substances very materially, so that they are more easily chewed and more easily and thoroughly digested. The second is to make food more appetizing by improving the appearance, the flavor, or both. Food which is attractive to the taste quickens the flow of saliva and other digestive juices, and thus digestion is aided. The third is to kill by heat any disease germs, parasites, or other dangerous organisms food may contain. This is often a very important matter, and applies to both animal and vegetable foods. The cooking of meats not only develops the pleasing taste and odor of extractives and that due to the browned fat and tissues, but it softens and loosens the protein (gelatinoids) of the connective tissues, and thus makes the meat more tender. Extreme heat, however, tends to coagulate and harden the albu-

minoids of the lean portions, and also weakens the flavor of extractives. If the heating is carried too far, a burned or charred product of bad flavor results. Meats lose weight in cooking. A small part of this is due to escape of meat juices and fat, but the chief part of the material lost is simply water. The nutritive value of a meat soup depends upon the substances which are dissolved out of the meat, bones, and gristle by the water. In ordinary meat broth these consist almost wholly of extractives and salts, which are very agreeable and often most useful as stimulants, but have little or no value as actual nutriment, since they neither build tissue nor yield energy. The principles which underlie the cooking of fish are essentially the same as with meats. See FISH AS FOOD.

In many vegetables the valuable carbohydrates, chiefly microscopic starch-grains, are contained in tiny cells with comparatively thick walls on which the digestive juices have little effect. The heat of cooking, especially with water, ruptures these walls and also makes the starch more soluble; without water it may also caramelize a portion of the carbohydrates and produce agreeable flavors in this and other ways.

In breads, cakes, pastry, and other foods prepared from flour, the aim is to make a palatable and lighter porous substance, more easily broken up in the alimentary canal than the raw materials could be. Sometimes this is accomplished simply by means of water and heat. The heat changes part of the water in the dough into steam, which, in trying to escape, forces the particles of dough apart. The protein (gluten) of the flour stiffens about the tiny bubbles thus formed, and the mass remains porous even after the steam has escaped. More often, however, other things are used to 'raise' the dough—such as yeast and baking-powder. The baking-powder gives off the gas carbon dioxide, and the yeast causes fermentation in the dough by which carbon dioxide is produced. This acts as the steam does, only much more powerfully. When beaten eggs are used, the albumen incloses air in bubbles, which expand, and the walls stiffen with the heat, and thus render the food porous.

PECUNIARY ECONOMY OF FOOD. Although the cost of food is the principal item in the living expenses of a large majority of the people, and although the physical welfare of all is so intimately connected with and dependent upon diet, very few of even the most intelligent have any ideas regarding the actual nutriment in the different food materials they use. In too many cases even those who wish and try to economize know very little as to the combinations which are best fitted for their nourishment, and have still less information as to the relation between the real nutritive value of different foods and their cost.

There are various ways of comparing food materials with respect to the relative cheapness or dearness of their nutritive ingredients. For instance, from the proportions of available nutrients and energy in different food materials given in Table III. we may calculate the cost of the different nutrients per pound, and of energy per 1000 calories in any given material for which the price per pound is known. Thus, for the different food materials given in Table V., when the price of any material is that given in the first column, the cost of protein and energy will

be as given in the second and third columns. These figures show the relative economy of the various foods as sources of protein and sources of energy. Of course the amount of energy that would be obtained in a quantity of any given material sufficient to furnish a pound of protein would vary with the amounts of fats and carbohydrates accompanying the protein; and on the other hand, the quantities of the different materials that would furnish 1000 calories of energy would contain different amounts of protein. The figures for cost of protein leave the carbohydrates and fats out of account, and those for energy take no account of the protein. Hence the figures for either protein or energy alone give a very one-sided view of the relation between nutritive value and money cost. A better way of estimating the relative pecuniary economy of different food materials is found in a comparison of the quantities of both nutrients and energy which can be obtained for a given sum, say ten cents, at current prices. This also is illustrated in Table V., which follows.

While in the case of certain foods as purchased, notably meats, some waste is unavoidable, the pecuniary loss can be diminished, both by buying those kinds in which there is the least waste, and by utilizing, more carefully than is ordinarily done, portions of what is usually classed as refuse. Much of the waste may be avoided by careful planning so as to provide a comfortable and appetizing meal in sufficient amount, but without excess. If strict economy is necessary, the dearer cuts of meat and the more expensive fruits and vegetables should be avoided. With reasonable care in cooking and serving, a pleasing and varied diet can be furnished at moderate cost. It should not be forgotten that the real cheapness or dearness of a food material depends not only on its market price, but also on the cost of its digestible nutrients. It should always be remembered that "the ideal diet is that combination of foods which, while imposing the least burden on the body, supplies it with exactly sufficient material to meet its wants," and that any disregard of such a standard must inevitably prevent the best development of our powers.

HYGIENIC CONSIDERATIONS. Scrupulous neatness should always be observed in keeping, handling, and serving food. If ever cleanliness is desirable, it must be in the things we eat, and every care should be taken to insure it for the sake of health as well as of decency. Cleanliness in this connection means, not only absence of visible dirt, from worms and other parasites, but freedom also from undesirable bacteria and other minute organisms. If food, raw or cooked, be kept in dirty places, peddled from dirty carts, prepared in dirty rooms and in dirty dishes, or exposed to foul air, disease germs and other offensive and dangerous substances can easily get in. Food and drink may, in fact, be very dangerous purveyors of disease. Experiments have clearly shown that fruits, vegetables, and other foods may readily acquire undesirable or dangerous bacteria if exposed to street dust. The bacteria of typhoid fever sometimes find their way into drinking-water; those of typhoid and scarlet fevers and diphtheria into milk. Thus sickness and death are brought to large numbers of people. Oysters which are taken from the salt water where they grow, and 'floated' for a short time in brackish water near the mouth of a

TABLE V.—COMPARATIVE COST OF DIGESTIBLE NUTRIENTS AND ENERGY IN DIFFERENT FOOD MATERIALS AT AVERAGE PRICES

[It is estimated that a man at light to moderate muscular work requires about 0.23 pound of protein and 3060 calories of energy per day]

KIND OF FOOD MATERIAL	Price per pound	Cost of 1 pound protein *	Cost of 1000 calories energy *	Amounts for 10 cents				
				Total weight of food material	Protein	Fat	Carbo-hydrates	Energy
	Cents	Dollars	Cents	Pounds	Pound	Pound	Pounds	Calories
Beef, sirloin.....	25	1.60	25	0.40	0.06	0.06	.....	410
Do.....	20	1.28	20	.50	.08	.08	.....	515
Do.....	15	.96	15	.67	.10	.11	.....	685
Beef, round.....	16	.87	18	.63	.11	.08	.....	560
Do.....	14	.76	16	.71	.13	.09	.....	630
Do.....	12	.65	13	.83	.15	.10	.....	740
Beef, shoulder clod.....	12	.75	17	.83	.13	.08	.....	595
Do.....	9	.57	13	1.11	.18	.10	.....	795
Beef, stew meat.....	5	.35	7	2.00	.29	.23	.....	1,530
Beef, dried, chipped.....	25	.98	32	.40	.10	.03	.....	315
Mutton chops, loin.....	16	1.22	11	.63	.08	.17	.....	890
Mutton, leg.....	20	1.37	22	.50	.07	.07	.....	445
Do.....	16	1.10	18	.63	.09	.09	.....	560
Roast pork, loin.....	12	.92	10	.83	.11	.19	.....	1,035
Pork, smoked ham.....	22	1.60	13	.45	.06	.14	.....	735
Do.....	18	1.30	11	.56	.08	.18	.....	915
Pork, fat, salt.....	12	6.67	3	.83	.02	.68	.....	2,950
Codfish, dressed, fresh.....	10	.93	46	1.00	.11	.....	.....	220
Halibut, fresh.....	18	1.22	38	.56	.08	.02	.....	265
Cod, salt.....	7	.45	22	1.43	.22	.01	.....	465
Mackerel, salt, dressed.....	10	.74	9	1.00	.13	.20	.....	1,135
Salmon, canned.....	12	.57	13	.83	.18	.10	.....	760
Oysters, solids, 50 cents per quart.....	25	4.30	111	.40	.02	.....	.01	90
Oysters, solids, 35 cents per quart.....	18	3.10	80	.56	.03	.01	.02	125
Lobster, canned.....	18	1.02	46	.56	.10	.01	.....	225
Butter.....	20	20.00	6	.50	.01	.40	.....	1,705
Do.....	25	25.00	7	.40	.....	.32	.....	1,365
Do.....	30	30.00	9	.33	.....	.27	.....	1,125
Eggs, 36 cents per dozen.....	24	2.09	39	.42	.05	.04	.....	260
Eggs, 24 cents per dozen.....	16	1.39	26	.63	.07	.06	.....	385
Eggs, 12 cents per dozen.....	8	.70	13	1.25	.14	.11	.....	770
Cheese.....	16	.64	8	.63	.16	.20	.02	1,185
Milk, 7 cents per quart.....	3½	1.09	11	2.85	.09	.11	.14	885
Milk, 6 cents per quart.....	3	.94	10	3.33	.11	.13	.17	1,030
Wheat flour.....	3	.31	2	3.33	.32	.03	2.45	5,440
Do.....	2½	.26	2	4.00	.39	.04	2.94	6,540
Corn meal, granular.....	2½	.32	2	4.00	.31	.07	2.96	6,540
Wheat breakfast food.....	7½	.73	4	1.33	.13	.02	.98	2,235
Oat breakfast food.....	7½	.53	4	1.33	.19	.09	.86	2,395
Oatmeal.....	4	.29	2	2.50	.34	.16	1.66	4,500
Rice.....	8	1.18	5	1.25	.08	.....	.97	2,025
Wheat bread.....	6	.77	5	1.67	.13	.02	.87	2,000
Do.....	5	.64	4	2.00	.16	.02	1.04	2,400
Do.....	4	.51	3	2.50	.20	.03	1.30	3,000
Rye bread.....	5	.65	4	2.00	.15	.01	1.04	2,340
Beans, white, dried.....	5	.29	3	2.00	.35	.03	1.16	3,040
Cabbage.....	2½	2.08	22	4.00	.05	.01	.18	460
Celery.....	5	6.65	77	2.00	.02	.....	.05	130
Corn, canned.....	10	4.21	23	1.00	.02	.01	.18	430
Potatoes, 90 cents per bushel.....	1½	1.00	5	6.67	.10	.01	.93	1,970
Potatoes, 60 cents per bushel.....	1	.67	3	10.00	.15	.01	1.40	2,950
Potatoes, 45 cents per bushel.....	¾	.50	3	13.33	.20	.01	1.87	3,935
Turnips.....	1	1.33	8	10.00	.08	.01	.54	1,200
Apples.....	1½	5.00	8	6.67	.02	.02	.65	1,270
Bananas.....	7	10.00	27	1.43	.01	.01	.18	370
Oranges.....	6	12.00	40	1.67	.01	.....	.13	250
Strawberries.....	7	8.75	47	1.43	.01	.01	.09	215
Sugar.....	6	.....	3	1.67	.....	.....	1.67	2,920

* The cost of one pound of protein means the cost of enough of the given material to furnish one pound of protein, without regard to the amounts of the other nutrients present. Likewise the cost of energy means the cost of enough material to furnish 1000 calories, without reference to the kinds and proportions of nutrients in which the energy is supplied. These estimates of the cost of protein and energy are thus incorrect in that neither gives credit for the value of the other.

stream, have been known to be affected by typhoid-fever germs brought into the stream by the sewage from houses where the dejections from patients had been thrown into the drains. Celery or lettuce has been thought to convey typhoid fever from having grown in soil containing typhoid germs.

Food materials may also contain parasites, like tapeworms in beef, pork, and mutton, and trichinæ in pork, which are often injurious and sometimes deadly in their effect. This danger is not confined to animal foods. Vegetables and fruits may be contaminated with eggs of nu-

merous parasites from fertilizers used in growing them. Raw fruit and vegetables should always be very thoroughly washed before serving if there is any doubt as to their cleanliness. If the food is sufficiently heated in cooking, all organisms are killed. Sometimes food undergoes decomposition in which injurious chemical compounds, so-called ptomaines, are formed. Poisoning by cheese, ice-cream, preserved fish, canned meats, and the like has been caused in this way. The ptomaines often withstand the heat of cooking. In some cases it has been found that foods are adulterated with compounds injurious to health; but

sophistication in which harmless articles of inferior cost or quality are added is more common.

Dainty ways of serving food have a usefulness beyond their æsthetic value. Every one knows that a feeble appetite is often tempted by a tastefully garnished dish, when the same material carelessly served would seem quite unpalatable. Furthermore, many cheap articles and 'left-overs,' when well seasoned and attractively served, may be just as appetizing as dearer ones, and will usually be found quite as nutritious.

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See articles on various materials used as food. See also **INFANTS, FEEDING OF**.

FOOD OF PLANTS. Carbonic acid and water are often spoken of as the food of green plants, but this is somewhat misleading; these substances are not themselves foods, but serve as material from which foods are made by the green cells of plants when sufficiently illuminated. (See **PHOTOSYNTHESIS**.) Various inorganic salts are sometimes reckoned among the foods. The rôle of these, however, is obscure at present, though some of the elements obtained from them, namely, potassium, magnesium, iron, and calcium, seem to be indispensable to the proper development and functions of the plant, and perhaps they are built into the protoplasm. At any rate the functions are profoundly altered when one element is replaced even by a similar element; e.g. potassium by sodium. Oxygen, too, has been included in the foods. But its relation to protoplasm in the process of respiration is uncertain, and for the present it is preferable to treat respiration and nutrition (q.v.) as distinct.

Excluding the substances mentioned, plant foods are complex carbon compounds, which belong mainly to four groups: carbohydrates, proteids, amides, and fats. They contain two or more of the elements carbon, hydrogen, oxygen, nitrogen, sulphur, and phosphorus, combined in the most various proportions. The value of a food, however, does not depend on chemical composition alone, but is profoundly influenced by its

constitution; i.e. the nature and arrangement of the atomic groups that make up its molecules. Apparently carbon is assimilable only when its atoms in the food molecules are directly combined with atoms of hydrogen. The introduction of a hydroxyl group (OH) seems to improve assimilability: thus glycerin, $\text{CH}_2\text{OH}.\text{CHOH}.\text{CH}_2\text{OH}$ is better than propyl alcohol, $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$. The aldehyde group (CHO), too, is characteristic of many foods. Very little, however, is known of the chemical constitution of most foods. See **RESPIRATION IN PLANTS**; **ABSORPTION, IN PLANTS**; **STORAGE**; **GROWTH**.

FOOD, PRESERVATION OF. Bacterial growth and action is the cause of the decay of all food products, as it is of organic matter in general. Hence all processes for preserving food from decay have the same object in view—the prevention of the growth of these micro-organisms. These processes may be grouped in three general divisions: (1) The various methods which subject food to some process of treatment designed to prevent the growth of bacteria; (2) the canning process, which first, by the application of heat, kills all the bacteria in the food, and then, by hermetically sealing the sterilized food, prevents the access of more bacteria; (3) the use of cold, to keep the food at a temperature below that at which those micro-organisms can develop. It is an interesting fact that all these processes for preserving food, except the use of a few of the antiseptics, were successfully practiced long before the relation of micro-organisms to fermentation and putrefaction was even suspected, and that industries founded upon them were thriving while the scientists were still disputing whether putrefaction could be avoided by preventing the access of bacteria. See **BACTERIA**.

The first group of preserving methods embraces all the processes used in ancient times for keeping food except that of freezing, and also includes the modern use of antiseptics as such. It therefore includes desiccation, curing, pickling, and 'preserving,' in the more limited sense in which this term is used by housewives. *Desiccation* is probably the oldest, as it is the simplest method of preserving fruits, vegetables, and even meats from decay. As organic life requires moisture, the thorough drying of the food checks its growth. This was first done in the sun or by the fire. During the nineteenth century, however, more scientific principles were applied, and the preparation of prunes, raisins, and other dried fruits for the market has become an important industry in Spain, Italy, and, more recently, in southern California.

The first patented process for the modern method of drying fruits and vegetables by evaporation was introduced by Chollet of Paris in 1852, and patented in England in 1854. It was chiefly applied to vegetables and a few kinds of fruit, such as apples and pears, which have a small amount of juice. By this method Chollet entirely removed all moisture from the vegetables by drying either in a vacuum or by the aid of heated air, which reduces their bulk more than one-half. They are then compressed under powerful presses, which, besides rendering them extremely portable, also makes them less liable to absorb moisture from the atmosphere, which is very desirable, as they are very absorbent. In this way both the color and distinctive flavor of

the vegetables are completely preserved, and mere soaking in water restores them almost precisely to their original condition. See RAISINS; PRUNES.

In the case of large pieces of meat, like hams, the mere process of drying is supplemented by the use of salt and by smoking over a wood fire, the chief preservative element in the smoke being creosote. This general process of preserving meat, subject to endless variations, is known as *curing*. This method has long been known to Oriental as well as Western nations, and it is still a very popular method of preserving meat. In the United States the large packing houses smoke immense quantities of meat with hickory wood. One establishment in Chicago has 43 smoke-houses, each of which holds 600,000 pounds of ham, or 120,000 pounds of side meat, besides 11 houses of half that capacity. (See HAM.) Certain fish and meats are cured by simply packing in salt or in a strong brine, salt being an excellent antiseptic or germ-killer.

PRESERVING AND PICKLING are the processes by which food, usually fruits, is preserved by the use of sugar, vinegar, or some alcoholic liquor, as brandy, or by a combination of sugar with brandy or vinegar, heat being applied. Fruits intended for confectionery are preserved in four different ways: They may be preserved in the form of jam, in which the fruit is simply boiled with from one-half to equal its weight of sugar. By this method the fruit becomes broken, and the juice set free; but all is preserved, as the latter forms a thick syrup with sugar. Such preserves can be kept, if well made, for several years, but are best used during the first winter. A second plan is to preserve only the juice, which, when carefully strained from the solid portions of the fruit, and boiled with a third or half its weight of refined sugar, constitutes the fruit jellies of the cooks and confectioners. Another method is called *candying*, and consists in taking fruits whole or in pieces, and boiling them in a clear syrup previously prepared. In this way they absorb the syrup, and are then dried by a gentle heat, which causes the sugar of the syrup to crystallize on the surface and through the substance of the preserved fruits, which retain their form, and much if not all of their color. The remaining method is to stew them carefully in a weak syrup of refined sugar and water, so that they are rendered soft but are not broken. They are then transferred, with the syrup, to jars with well-prepared covers, to prevent evaporation; and pale brandy, equal in quantity to the syrup, is added. As a rule only stone-fruits, such as peaches, plums, and cherries, are preserved in this way. Several fruits and vegetables, such as olives, cucumbers, cabbage, etc., are preserved for food in a saturated solution of salt and water poured in hot; others, in vinegar.

FOOD PRESERVATIVES. The use of antiseptics for the preservation of food is a recent and rapidly growing practice which is liable to great abuse, and against which it is believed that strict sanitary regulations should be enforced. The scientific side of the subject has been discussed under ANTISEPTIC.

Of the 67 samples of commercial food preservatives examined by W. D. Bigelow, of the Division of Chemistry in the United States Department of Agriculture, 33 contained borax or boric acid; 10 sodium, potassium, or calcium sulphite; 8 sal-

icylic acid or its sodium compound; 1 boric acid and salicylic acid; 1 boric acid and ammonium fluoride; 3 formaldehyde; 7 common ammonium fluoride; 2 pyroligneous acid; and 1 beta-naphthol. Certain of these substances are undoubtedly injurious, such as formaldehyde, salicylic acid, and sulphites, and in the case of others, like borax and benzoic acid, the toxic action is disputed. Passing on to the consideration of the effect of each of these different drugs on the system, it is shown that a pound of meat treated according to directions with *borax* would contain four or five more grains than a physician's dose, and that an infant who is fed a quart of milk each day so treated will receive eight grains, a fair-sized dose for an adult.

The use of *sulphites* is less common in food preservatives, but far more dangerous. In the preparation of casks for storing wine it has long been customary to treat them with a small amount of burning sulphur. The sulphurous acid so formed assists in sterilizing the casks and preventing the after-fermentation of the wine. In all wine-producing countries except America the amount of sulphurous acid so employed is limited by law to one or two parts in 10,000 parts of wine. Free sulphurous acid and sulphites are permitted in European wines in only one-tenth the amount given above. The compound is recognized as distinctly toxic, and a larger proportion than that mentioned is universally recognized as injurious. The sale of beer containing sulphurous acid or sulphite is specifically prohibited in almost all civilized countries. By following the directions of dealers in food preservatives we would add one to four ounces or its equivalent of this substance to 100 pounds of meat, or the same amount to from 35 to 50 gallons of cider, beer, or other liquid. *Salicylic acid* (q.v.) is chiefly used in the United States to preserve fruit and vegetable products. Many European countries prohibit its use as a food preservative altogether, and its use is condemned by the result of all recent physiological studies. It is possible that the majority of persons in sound health may suffer no evident injury from its use in small amounts, but its use by aged and infirm persons is attended with great danger. The use of *benzoic acid* as a food preservative is widespread and rapidly increasing, having been substituted by many manufacturers for the more harmful salicylic acid. Mr. Bigelow concludes that there are doubts as to the wholesomeness of this compound, and contends that food containing it should always be so labeled. *Formaldehyde* has been used as a preservative since 1895, and is most commonly employed for the preservation of milk. Its use is undoubtedly objectionable, and should be prohibited. Not only does it interfere with digestion to a marked extent, but it has been definitely proved that a compound is formed with the casein of milk, which causes the latter, when treated with dilute acid, such as exists in the gastric juice, to separate in hard lumps that are attacked with difficulty by the digestive ferments. Aside from the actual danger of its use, there is always the likelihood that its action will be depended upon to keep milk sweet, to the neglect of the cleanliness which should characterize the handling of this most easily contaminated food material. The *fluorides* and *beta-naphthol* are condemned unqualifiedly, there being no doubt of their toxic properties. Various attempts have been made

to use *pyroligneous acid* for the curing of meats in place of the more tedious process of smoking. The trade name for this compound is 'liquid smoke.' Its effects, from a hygienic standpoint, have not been ascertained, but it is certain that meat treated with a bath in *pyroligneous acid* should not be sold as smoked meat.

An attempt has been made to prevent meat from putrefying by introducing an antiseptic liquid into the circulation of the animal before being killed. The bullock is first stunned by a blow, the jugular vein is then opened, and a small quantity of blood drawn. A tube is afterwards inserted, through which the antiseptic mixture is forced into the circulation, and after a few minutes the animal is killed. Meat treated in this way keeps fresh for several weeks.

CANNING. The process of hermetically sealing food to preserve it for future use was discovered in 1795 by a Frenchman named Nicholas Appert. Fourteen years later Napoleon gave him a prize of 12,000 francs for his invention. He continued his researches through life, spending all his money upon them, and, like many other inventors, died alone, in poverty and neglect. In 1810 an English patent was taken out for Appert's process, from which, however, the latter derived no benefit. From England the knowledge of the process was soon brought to America. Lobsters and salmon were the first goods canned in America, but by 1825 fruits and vegetables were also canned. In 1849 a factory was established at Newark, N. J., where fruits and vegetables were canned for Dr. Kane's Arctic expedition. The discovery of gold in California the same year gave a great impetus to the canning industry.

During the Civil War canned condensed milk, the process of making which had been patented by Gail Borden in 1856, was in great demand.

Glass jars were at first used, but their use was soon abandoned on account of their perishability, bulkiness, and expensiveness, and in 1823 Thomas Kensett secured a patent on the use of tin cans for this purpose, and this material has since been universally employed. At first the cans were cut out with shears, beaten together over a former, and soldered by hand. The cans were crude, and their manufacture very expensive. In 1847 Allen Taylor invented the stamp can, and two years later Henry Evans invented a press for stamping out can-tops. The key-opening can, which was perfected by Zimmerman, is a much more recent invention.

By the Appert process the goods were cooked in open kettles, in which, of course, the highest obtainable temperature was 212 degrees. By adding chloride of calcium to the water the temperature could be raised to 240 degrees. About 1874 John Fisher invented a patent process kettle in which the goods are heated to any desired temperature with dry steam; at about the same time A. K. Shriver invented a closed-process kettle in which the goods are cooked by superheating water with steam. Both of these methods are now in use. In the modern canning factory the goods are immediately sorted and placed in the cans, and the caps soldered on. In each cap there is a hole for the escape of gas and steam during the cooking process. The cans are then placed in a steel boiler, the cover of which is bolted down, and steam turned in, which sterilizes the contents by heating to the proper temperature under pressure. They are then hermetically sealed by

placing a drop of solder on each vent-hole, and are ready for shipment. Not only raw foods, but a large variety of made dishes, as soups, sauces, and jams, are put up in this way.

The canning of fish requires greater care than that of fruit and vegetables because fish decay so much more rapidly. It is said that long before the Appert process was invented the people of Holland had learned the art of canning salmon, so as to arrest putrefaction. The fish were boiled in a salt brine, then smoked, and then sealed in tin cans liberally supplied with butter. The salmon canneries of the Pacific are usually located on the water's edge. The fish immediately upon receipt are subjected to an ice-cold bath, and after being dressed are again washed. They are cut up by machinery into pieces the length of the can, and are then subjected to such intense heat that not only the fish but the bones are cooked so that they will crumble. The cans are tightly soldered for the first cooking. They are then tested by the process known as 'blowing' or 'venting,' which consists in making a small perforation in each can to permit the escape of steam. The can is then placed in another steam-heated retort for the final cooking, after which it is given a lye bath to remove grease. After cooling the cans are lacquered and labeled, ready for market.

The canning of oysters has been encouraged by various improvements. At first the oyster-shells were opened by hand. In 1858 Louis McMurray began scalding the oysters before they were shelled, a treatment which greatly facilitated the latter operation. In 1862 steam was used instead of hot water. This was at the suggestion of Henry Evans, who devised a steam-chest holding about twenty bushels of oysters. A door is at each end of the air-tight chest and through it runs a track on which the carload of oysters is pushed in. After steaming fifteen minutes the oysters are easily shelled with a knife by skilled operatives. They are then canned in the usual manner.

The objection has been urged against the use of tin cans that the natural acids of fruits, vegetables, and meats act upon the tin and solder in such a way as to form metallic salts or metallic compounds that are injurious to health. According to a statement in a section on the canning and preserving of foods in the United States Census for 1900, the matter has been carefully investigated by expert chemists, who have reported that if good tin is used the objection is groundless. In the poorer grades of tin injurious substances were found, but in such small quantities that they were of no consequence.

STATISTICS OF THE CANNING INDUSTRY. According to the census report just mentioned, 2195 establishments in the United States were engaged in 1900 in the canning of fruits and vegetables, fish and oysters. The total capital invested in this industry was given as \$48,497,978, and the annual value of the products as \$82,592,196. The industry is divided into three distinct branches, the canning of fruits and vegetables being handled by one group of establishments, the canning of fish by another, and the canning of oysters by another. Of the 2195 canning factories, 1808 belong to the first-named class, 348 to the second, and only 39 are reported as engaged in canning oysters. The canning of fruits and vegetables is well distributed over the country, but the largest

number in any one State, 136, is in California. In canning fish Maine leads with 117 establishments and Alaska comes next with 36. The most important branch of the industry is the salmon-canning of the Pacific Coast, next to which comes the sardine-canning of Maine. Oysters are canned on the shores of the Chesapeake and of the Gulf of Mexico. Considering the growth of the industry as a whole, we find that fruit and vegetable canning factories have increased from 97 in 1870 to 1808 in 1900; fish-canning factories have increased from 110 in 1890 to 348 in 1900. The value of canned goods imported into the United States in 1900 was \$8,023,763, and of exports for the same year, \$19,557,857.

COLD STORAGE. The use of artificial cold for the preservation of perishable foods, either in storage or transit, was introduced during the last quarter of the nineteenth century, and has effected a complete revolution in the method of handling food, particularly meat. The method by which the temperature is lowered for cold storage is described under **REFRIGERATION**. Some of the practical results of cold storage are discussed under **PACKING INDUSTRY**.

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FOOL. See **COURT FOOL**.

FOOL OF QUALITY, THE. A quasi-historical religious novel, by Henry Brooke (1760-70). It was revised and republished by Wesley during the author's lifetime without the author's consent, under the title of *The History of Harry, Earl of Moreland*, and was again republished in 1859 by Charles Kingsley with a biographical memoir. The story was suggested by a tale told the author by his uncle during a horseback journey, and was one of the most remarkable books of its time.

FOOLS, FEAST OF. See **FEAST OF FOOLS**.

FOOL'S ERRAND, A. A novel of the South in the Reconstruction period, by Albion W. Tourgée (1879). The career of the hero, Comfort Servosse, shows vividly the difficulties of Northerners living in the South at that time.

FOOL'S PARADISE (Lat. *limbus fatuorum*). That division of *limbus* (q.v.) in which the souls of fools, idiots, and lunatics, who are not responsible for their sins, nor yet deserving of heaven, await the Resurrection. As commonly used, the expression denotes a state of insecure joys, false hopes, and sometimes of unlawful love.

FOOL'S PARSLEY. An umbelliferous weed, very common in gardens and fields of Europe, and introduced into the United States from New England to Minnesota. The only species, *Ethusa cynapium*, is a poisonous plant with properties similar to those of the hemlock, and resembles parsley in its manner of growth and foliage. It is frequently mistaken for parsley, and is the cause of serious accidents.

FOOL'S REVENGE, THE. A tragedy by Tom

Taylor, produced at the Queen's Theatre, London, in 1869. It was taken bodily from Hugo's *Le roi s'amuse*.

FOOT. See **WEIGHTS AND MEASURES**.

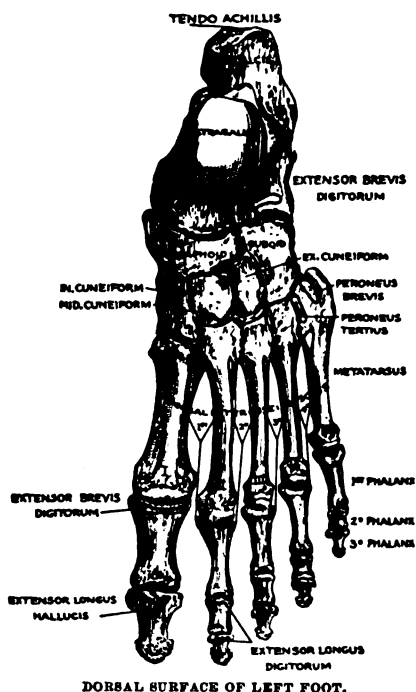
FOOT (AS. *fōt*, Icel. *fōtr*, Goth. *fōtus*, OHG. *fuoz*, Ger. *Fuss*, foot; connected with Lat. *pes*, Gk. *pois*, *pous*, Lith. *padas*, Av. *pāda*, Skt. *pada*, foot). In music, a unit of measure used in determining the pitch of organ-stops. The Germans have always used the word *pusston* in representing the pitch of the different stops of an organ, such as *Principal* sixteen-foot, eight-foot, or four-foot, etc., a practice which has been universally introduced, and is found very useful to organists. The pitch of the stop is fixed according to the length of the lowest C pipe. Thus an eight-foot stop is one whose longest pipe produces the tone C; a four-foot stop is an octave stop; and a sixteen-foot stop gives tones an octave lower than the notes indicated by the keys used. See **ORGAN**.

FOOT (in verse). See **VERSIFICATION**.

FOOT. In describing the structure of the foot, it is expedient to commence with a brief notice of the bones which occur in it. In man these are 26 in number, and are arranged in three natural groups—viz., the tarsal bones, corresponding to the carpal bones of the hand, which are the hindermost; the metatarsal bones, which occupy the middle portion; and the phalanges of the toes anteriorly. The tarsal bones, seven in number, are short and thick, and form the heel and the hinder part of the instep. The uppermost is called the *astragalus*, from its supposed resemblance to the dice used by the Romans. Above it is articulated or jointed with the two bones of the leg, the *tibia* and *fibula*, and through these bones the whole weight of the body is thrown upon the two *astragali*. Behind, it is connected with and rests upon the *os calcis*, or heel-bone, which is the largest bone of the foot. Immediately in front of it, and supporting it in this direction, is the *scaphoid* or boat-like bone. In front of the scaphoid bone are the three *cuneiform* or wedge bones; and on the outer side of the cuneiform bones, and in front of the *os calcis*, is the *cuboid* bone. The front row of tarsal bones is composed of the three cuneiform bones on the inner side of the foot, and of the cuboid bone externally. There are five metatarsal bones passing forward, one for each toe. Each cuneiform bone is connected with one, and the cuboid bone with two, of these metatarsal bones. Behind, they are close together, but as they run forward they diverge slightly from one another, and their anterior ends rest upon the ground, and form the *balls* of the toes. They constitute the fore part of the instep. The remaining bones are those of the toes, and are named the *phalanges*, each toe having three of these bones, excepting the great toe, which has only two.

The instep is composed of the seven tarsal and the five metatarsal bones, which are so arranged and connected as to form an arch from the extremity of the heel-bone to the balls of the toes. This is called the *plantar arch*, from *planta*, the sole of the foot. The *astragalus* forms the summit or keystone of this arch, and transmits the weight which it receives posteriorly to the heel, and anteriorly to the balls of the toes. The arrangement of the fibres and laminae in the interior of the bones is such that the greater num-

ber of them in each bone follow the directions of the two pillars of the arch, and thus give the greatest strength to the bones in the directions in which it is most required. There is also an arch from side to side in the foot, springing from the cuboid on the outside to the inner cuneiform on the inside. See FOOT, COMPARATIVE ANATOMY OF.



DORSAL SURFACE OF LEFT FOOT.

The bones, where they articulate with one another, are covered with a tolerably thick layer of highly elastic cartilage, and by this means, together with the very slight movements of which each bone is capable, a degree of elasticity is given to the foot, and consequently to the step, which would be altogether wanting if the plantar arch were composed of one single mass of bone. This elasticity is far greater in the anterior pillar of the arch, which is composed of five comparatively long bones sloping gradually to the ground, than in the posterior pillar, which is short, narrow, and composed of a single bone, which descends almost vertically from the ankle to the ground. Hence, in jumping from a height we always endeavor to alight upon the balls of the toes and thus break the shock which we should feel if, by accident, we descended upon the heels.

The ligaments which unite these bones to one another, and by which the movements of each bone upon the others are limited, are very numerous. We shall merely notice two of these ligaments, selecting those whose action is especially obvious in maintaining the shape of the plantar arch. One, the *plantar*, or *long calcaneo-cuboid ligament*, of great strength, passes from the under surface of the *os calcis*, near its extremity, forward to the bases of the second, third, and fourth metatarsal bones. It extends between the lowest points of the two pillars of the arch, holding them in their places, and pre-

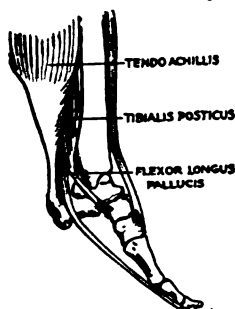
venting their being thrust asunder when pressure is made upon the key-bone. It converts the groove on the under surface of the cuboid bone into a canal for the passage of the tendon of the *peroneus longus* muscle. Another very strong ligament passes from the under and fore part of the *os calcis* to the outer side of the scaphoid bone. This is the *superior calcaneo-scaphoid ligament*. The *interosseus*, or *internal calcaneo-cuboid ligament*, directly connects the *os calcis* and the cuboid bones. It is blended at its origin with the *superior calcaneo-scaphoid ligament*; and by separating in front they present such an appearance as to be called the Y ligament. The Y ligament underlies and supports the round head of the astragalus, and has to bear a great deal of the weight which is transmitted to that bone from the leg. It possesses a quality which the ligament just described, and most ligaments, have not—viz., elasticity. This is very important, for it allows the head of the key-bone to descend a little when pressure is made upon it, and forces it up again when the pressure is removed, and so gives very material assistance to the other provisions for preventing jars, and for giving ease and elasticity to the step.

The spot over which this ligament extends is the weakest in the foot, the astragalus being there unsupported by any bones; additional support is, however, afforded when it is most required by the tendon of a strong muscle, the *posterior tibial*, which passes from the back of the tibia (the chief bone of the leg) round the inner ankle, to be inserted into the lower part of the inner surface of the scaphoid bone. It not infrequently happens that the astragalus, from either being insufficiently supported or being overweighted, descends slightly below its proper level, causing a lowering of the arch and a flattening of the sole of the foot. The defect, when slight, is known as 'weak ankle;' when more decided it is termed 'flat-foot;' and in extreme cases the bone may descend to such an extent as even to render the inner side of the foot convex when it naturally should be concave. There are two periods of life at which *flat-foot* is especially liable to occur: (1) In infancy, if the child be put upon its feet before the bones and ligaments—especially the latter—are strong enough to bear its weight; and (2) about the age of 14—a period at which growth is very quick, and the body consequently attains a considerable and rapid augmentation of weight.

We now come to the movements of the foot upon the leg. We see here a striking combination of variety of movement with general security. This combination is effected by the harmonious action of three joints, each of which acts in a direction different from the others. The first of these joints is the ankle-joint, which is formed by the bones of the leg—the tibia and fibula—above and the astragalus below. By this joint the foot is bent or straightened on the leg. The second joint is between the astragalus and the heel-bone, and it permits the foot to be rolled inward or outward; while the third joint is between the first and second row of tarsal bones—namely, between the astragalus and heel-bone behind, and the scaphoid and cuboid bones in front—and allows the degree of curvature of the plantar arch to be increased or diminished within certain limits. The following is the order in which the movements of these three joints oc-

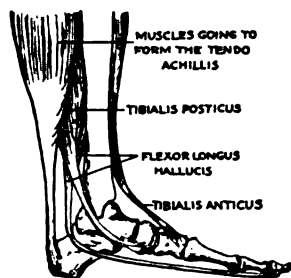
cur: the raising of the *heel* (by the first joint) is accompanied by a rolling of the foot inward (by the second joint), and by an increased *flexure* of the plantar arch (by the third joint); and the raising of the *toes* is accompanied by a rolling of the foot outward and a *straightening* of the sole.

The joints, however, merely allow of movements—they do not effect them; this is the special function of the muscles, and each of the three movements we have indicated is effected by special groups of muscles. The first series of movements is mainly effected by three muscles,



EFFECT OF MUSCULAR ACTION IN THROWING UP THE ARCH.

viz.: (1) the muscles of the calf, attached above to the bones of the thigh and leg, and below by the *tendo Achillis* to the heel-bone; (2) the posterior *tibial*, attached above to the tibia, and below by its tendon to the scaphoid bone; and (3) the *peroneus brevis*, attached above to the fibula, and below by its tendon to the outer metatarsal bone. The calf-muscles, whose tendon is inserted into the heel-bone, are large and very powerful, for in raising the heel they have to raise the weight of the body. The other two muscles, the posterior *tibial* and the short *peroneal*, turn round the inner and outer ankle respectively, and are inserted into the inner and the outer edges of the instep—the former being attached to the scaphoid, and the latter to the outer metatarsal bone. They not only assist to raise the ankle, but support it laterally.



ARCH OF THE FOOT IN ORDINARY STANDING POSITION.

The muscle whose tendon is on the inner side of the foot (the posterior *tibial*) effects the two movements which are associated with the raising of the heel-bone, namely, the turning of the foot inward and the increased flexure of the arch. The second series of movements—the raising of the toes, the turning of the foot outward, and the straightening of the sole—are effected by two muscles, the anterior *tibial* and the third *peroneus*, whose tendons pass, one in front of the inner ankle, and the other in front of the outer ankle, to the corresponding edges of the instep, and are inserted into the internal cuneiform and the outer metatarsal bones. The muscles are direct flexors of the tarsus upon the leg, the former raising the inner and the latter the outer border of the foot.

Another point in the anatomy of the foot that requires notice is the mode of union of the metatarsal with the tarsal bones. In these joints in the fourth and fifth toes a slight revolving motion can take place, which probably enables the outer metatarsals to adapt themselves to inequalities of the ground, and to equalize

the distribution of the weight which is thrown upon the foot; while in the corresponding joints of the three inner toes scarcely any motion can occur—a provision by which additional strength is given to the inner side of the foot, upon which the weight of the body most directly falls.

The skin of the sole is very tough and strong; and intervening between it and the bones and long plantar ligament is a thick pad of fat, which acts the part of an air or water cushion in defending the adjacent parts from injurious pressure, and in deadening the jars and shocks that would otherwise be felt in leaping, etc.

Consult: Humphry, *The Human Foot and the Human Hand* (London, 1861); Owen, *On the Anatomy of Vertebrates* (London, 1866); Morris, *Treatise on Anatomy* (London, 1902).

FOOT, COMPARATIVE ANATOMY OF THE. As locomotor appendages, so called, feet occur in echinoderms, mollusks, and arthropods among vertebrates, but they are not in any way homologous with the feet of the higher vertebrates. Among echinoderms the name 'foot' is given to any appendage of the ambulacral system which terminates in a sucker, and in the case of starfishes it is extended to any of the appendages lying in the ambulacral groove. These echinoderm feet are often, but by no means always, used for locomotion. Mollusks possess a very muscular and usually largely developed organ, primarily concerned with locomotion, known as the foot; it is flat or concave in the chitons and gastropods, and covers the ventral side of the body; in lamellibranchs it is also ventral in position, but is wedge-shaped and laterally compressed; in cephalopods it is anterior in position, surrounding the mouth, and is divided up into a siphon, placed posteriorly, and a number of outgrowths known as tentacles or arms. Among cephalopods the chief function of the arms is for capturing prey, locomotion being provided for in other ways, chiefly by means of the siphon, which is formed by the union of two epipodial folds. The 'feet' of arthropods show a very great variety of form, due chiefly to the variety of functions which they perform. In most cases it is practically impossible to distinguish between leg and foot, the latter consisting merely of the terminal joint or joints of the former. In many insects, however, the terminal part of the leg is so placed, with reference to the other joints, when in use, that it has both the appearance and function of a foot.

AMPHIBIANS AND REPTILES. Passing over the non-homologous fins of fishes, we may first mention the foot of the Urodela, the short-legged amphibians. As in all vertebrates, the feet here are the termination of the hind limbs, and their skeleton consists of two or three parts, according to whether we include the ankle-bones or not. Most distal of all are the phalanges of the digits or toes, then follow the metatarsals, and most proximal are the tarsals. In the Urodela, the feet are supplied with five digits in most cases, but some have only four, and *Proteus* has only two; the digits lack nails or claws; the number of phalanges differs in the various digits as well as in various species. The metatarsals are of the same number as the toes and appear like their proximal joint. The tarsals are a group of nine bones, of which one, the centrale, occupies a middle position; distal to it are five others of approximately uniform size, called tar-

sales; proximal to the centrale are three bones, of which the inner is the tibiale, the outer the fibulare, and the middle one the intermedium. In the Anura (frogs, toads, etc.) the foot is very much larger, and the toes, five with no nails, are broadly webbed; phalanges and metatarsals are greatly elongated, as are also two of the tarsal bones, which are known as the astragalus and the calcaneum; the former is the tibiale, with which the intermedium has fused, while the latter is the fibulare. The Chelonia (turtles, etc.) have five digits, but in the marine forms the toes are more or less firmly united together by the integument, thus forming paddles useful in swimming. Some or all of the digits of Chelonia bear nails or claws. The phalanges and metatarsals are stout and short, except in the marine forms, where they are elongated and flattened. The fifth metatarsal has the appearance of being bent in the middle. The tarsal bones undergo various fusions, so that their number and arrangement differ in different genera. The tibiale and intermedium are generally united into an astragalus, which in some cases includes the centrale also, and in one genus (*Emys*) even the fibulare, thus making a single bone of the whole proximal series. The two outer tarsals are fused to form the cuboid. Lizards usually have five digits, two, three, four, five, with four phalanges respectively, beginning at the inner side; the fifth metatarsal is bent as in the turtles, and is perhaps fused with the fifth tarsale, in which case the ankle-joint would come in part between the two rows of tarsal bones, which is the condition of the ankle in birds. In lizards we find an astragalus and calcaneum proximally and a cuboid distally, with sometimes one or two more of the tarsales. Feet are entirely lacking in snakes, unless the spur on each side of the body near the vent in the boas and pythons be regarded as such. Crocodiles have only four toes, though an examination of the skeleton reveals a rudimentary fifth metatarsal; the four digits have respectively two, three, four, and four phalanges, and only the first three have claws. Only four tarsal bones are present, of which the two distal ones are small, while the two proximal, called astragalus and calcaneum, are large; the latter bears a prominent calcaneal process projecting posteriorly, which forms a heel to the foot—the first occurrence of such a thing in the animal kingdom.

BIRDS. Among birds the feet are so profoundly modified by the various uses to which they are put that we find a very great variety of external form, but the skeletal structure shows considerable uniformity. The number of digits is usually four, not rarely three, and in the ostrich only two; the fifth toe is the one always missing, the first occasionally, and in the ostrich the second also; the phalanges are almost always two, three, four, and five, or rarely, two, three, four, and three, or in swifts, two three, three, and three. The metatarsals are more or less completely fused into a single bone, the upper end of which is fully fused with the distal row of tarsal bones. The proximal tarsal bones are fused with the lower end of the tibia, so that the ankle-joint is actually between the two series of tarsal bones. In the foot of a bird, therefore, what is usually termed the 'heel' is simply the base of the digits; the so-called 'tarsus' (see **BIRD**) is really a tarso-metatarsus, and the

'tibia' is a tibio-tarsus. The foot of a bird is usually free from feathers, and is generally covered with scales, and the digits terminate in straight or more or less hooked claws. In some birds, however, especially among the grouse and the birds of prey, the feet are feathered (at least in front) to the base of the toes, and in ptarmigans even to the claws.

MAMMALS. Among mammals there is perhaps even greater variety in the form and structure of the foot than among birds, but the foot of mammals is usually very similar to the hand, except in the highest forms. In the orders Sirenia and Cetacea there is no foot whatever, and among the aquatic Carnivora (seals, etc.) it is modified to form a sort of flipper of great use in swimming; this is accomplished by the lengthening of the first and fifth digits, the great reduction of the heel, and the greater or less union of the leg with the tail and posterior part of the body. The number of functional digits in mammals varies from one to five, but frequently, where the number is below five, rudimentary digits are present. The digits terminate either in claws, nails, or hoofs, according to the habits of the animal; the number of phalanges is remarkably constant—in the first digit two, and three in each of the remaining four. In the Ungulata the metatarsals are often fused to form a long tubular bone, the 'cannon-bone.' The tarsus of mammals contains from six to eight bones, according to the amount of fusion; the intermedium is distinct only in marsupials, in the Monodelphia being fused with the tibiale to form the astragalus; the fourth and fifth tarsals fuse into a single bone known as the cuboid; the centrale is called the navicular, and the calcaneum is called the pisiform bone; the other tarsals are known as cuneiform bones, and the inner and second one sometimes fuse to form a single bone. Lack of space forbids any discussion of the general appearance of the feet and their special uses in mammals, but it may be remarked that if the whole sole of the foot is applied to the ground the animal is called 'plantigrade,' like man; if only the toes form the supporting portion of the foot, the animal is 'digitigrade'; and if only the distal phalanx serves for support (as in the horse) the creature is 'unguligrade.'

Consult: Wiedersheim, *Comparative Anatomy of Vertebrates* (New York, 1886); Huxley, *Anatomy of Vertebrated Animals* (New York, 1886); Baur, "On the Morphology of the Tarsus in Mammals," in *The American Naturalist*, vol. xix. (Philadelphia, 1883).

FOOT, SOLOMON (1802-66). An American lawyer and legislator. He was born in Cornwall, Vt., graduated at Middlebury College in 1826, and was professor of natural philosophy in the Vermont Academy of Medicine from 1828 to 1831, when he was admitted to the bar. After serving for several terms in the State Legislature, for three years (1836, 1838 and 1847) as speaker of the House, he was one of the Representatives of his State in Congress from 1843 to 1847, and from 1851 until his death was a member of the United States Senate, serving as president *pro tempore* during a part of the Thirty-sixth and the whole of the Thirty-seventh Congress. At first a Whig, he joined the Republican Party at the time of its formation in 1856.

FOOTA-JALLON, fōō'tā'zhā'lōn'. See FUTA-JALLON.

FOOT-AND-MOUTH DISEASE, or **APHTHOUS FEVER**. A virulent infectious disease, characterized clinically by a condition of fever followed by eruptions on the integument especially of the mouth and feet. Since the middle of the eighteenth century outbreaks of an epizootic form have been frequently recorded among cattle, which, like pigs, are especially subject to it. It also occurs in sheep, goats, and other even-toed ungulates. Man is frequently affected. In European countries, where the disease usually prevails and causes great losses, the outbreaks have usually spread from Asia. Africa has also been visited.

The disease may appear under a mild or a grave form. In the mild form symptoms of fever and general lassitude are observed. Bladder-like eruptions appear, especially on the mucous membrane of the mouth, between the hoofs, and on the mammary gland. The last-named location is most frequently attacked during the secretory condition of the gland. Mammitis is a frequent complication of the disease. The mortality from this form of the disease in cattle is usually from two to fifty for each one thousand cases. In the grave form of the disease eruptions occur on internal mucous surfaces of the digestive or respiratory tracts. The symptoms in such cases are those of acute bronchitis, pneumonia, or enteritis, according to the part which is affected. The mortality in this form varies from 15 to 20 per cent. In sheep the eruptions on the feet are usually more serious and persist for a longer time. In sucking lambs the disease assumes the intestinal form, and is especially fatal. The disease spreads rapidly among animals confined in the same stable. Infection may be produced by the eruptions on the feet. Infected water is another common means of dissemination. The virus of the disease may gain entrance to the organism through the uninjured mucous membranes of the mouth, respiratory passages, or the alimentary tract. The pathogenic organism of this disease has never been isolated. The period of incubation after infection by natural methods is from two to six days. The virus is readily destroyed by desiccation or by exposure to air and sunlight. It possesses a weak resisting power to antiseptics such as carbolic acid and formaldehyde. Inoculation with serum from animals which have recovered from the disease does not confer immunity. Loeffler and Frosch succeeded in producing immunity to the disease by intravenous injections of lymph from aphthous subjects, but the results were not constant. No medicament has been found to have a specific action on the development of the disease. The mucous surfaces upon which eruptions occur may be washed with antiseptic solutions, and other symptoms may be combated as they appear. The chief reliance should be placed on proper sanitary measures. Diseased animals should be immediately isolated and infected stables should be strictly quarantined. It would be well to abandon the use of such stables until they have been thoroughly cleaned and disinfected.

The meat of aphthous animals is not considered dangerous as food for man. The milk of such animals is, however, highly infectious. The disease may also be contracted from eating infected butter and cheese. Consult: Nocard and Le-

clainche, *Les maladies microbiennes des animaux* (Paris, 1898); Murray, and others, "Special Report on Diseases of Cattle," in *United States Department of Agriculture, Bureau of Animal Industry* (Washington, 1892).

FOOTA TORO, fōō'tā tō'rō. See FUTA TORO.

FOOTBALL. An outdoor game played by opposing teams, with an inflated ball. The main object on each team's part is the passing the ball over or through the goal in the other team's territory. It is principally played in Great Britain, North America, and Australia, but varieties of it may be found in many parts of the world. In the Philippines and through the Polynesian Islands it is played with a light ball made of thin split fibres of the bamboo ingeniously twisted and interlaced. The Eskimo play it with a similar ball made of strips of leather. The Farøe Islanders and the Maoris of New Zealand both play a native football. The ancient Greeks and Romans played a game somewhat akin to football. English lads in very early times made use of the bladder without the covering in a contest out of doors. Barclay, an early poet (d. 1552), describes the game graphically, and William Fitzstephen, in his *Vita Sancti Thomæ*, at the end of the twelfth century notes the well-known game of ball played on Shrove Tuesday. So popular did it become that its history is for centuries almost entirely one of futile repressive measures. Edward II. (1314) forbade it on account of "the great noise in the city [London] caused by hustling over large balls," and it fell under the ban of succeeding sovereigns, both in England and Scotland. James I., who favored athletic pastimes, condemned football "as meeter for laming than making able the users thereof." With the triumph of Puritanism came the decadence of football; though it was maintained here and there as a game between villages, the goals at either end sometimes being as far apart as one village from another, and it was played intermittently and without any rules but tradition well into the nineteenth century. By 1849 it was played in the English universities, but its official entry into modern life, as a defined game, was in 1863, when rules were drawn up by players of the University of Cambridge and representative old public school men, and the present 'association' game came into existence by the federation of clubs known as the 'Football Association.' This association failed to satisfy those who had for years followed the game under the traditional rules of Rugby school, and in 1871 the 'Rugby Football Union' was established, and rules formulated for all those following that style of play.

In America the game had an independent origin, with varying practices and fortunes. It was played at Yale as early as 1840, and continued in a somewhat desultory manner until 1859. Then came a period when it fell into desuetude. It does not appear again as an active force until 1870. From that time onward its growth and popularity has been uninterrupted. Lack of uniformity in methods and rules threatened to restrict its sphere: A beginning of uniformity was made in 1873, when Columbia, Rutgers, Princeton, and Yale met in convention, and in 1875 the regular Rugby Union rules of that year were adopted; but after the first matches of that year it soon became evident that those rules were not adapted for America. In 1876

they were varied in material points, and they have been in continuous evolution ever since. The game played in Australia is, in like manner, an outgrowth of the English game. The Gaelic game is Irish football under its own rules, and must not be confused with the 'Irish Rugby Union' play. In Great Britain playing football in both its styles, 'association' and Rugby, has become so universal that each of the four component divisions of the United Kingdom has its national association in each game, and there are international associations controlling the contests between the four. 'Rugby' is controlled by an 'International Football Board' consisting of twelve members—six from England, and two from each of the other nationalities. All international matches are played under rules subjected to its approval, but it has no jurisdiction over the game as played within the limits of the four separate unions. 'Association' in its international relations is under the control of an 'International Association Board' composed of eight members, two of whom represent England, Scotland, Wales, and Ireland respectively. In both games a selection committee of each country is responsible for the team to represent it. Besides the great international contests there are contests of groups of counties, and of counties within the groups; of towns, one against the other; and of village against village. It is impossible to convey, in a general description, the extent of football ramifications in Great Britain. One illustration must serve: It is no unusual thing for the final match betwixt the 'North' and 'South' of England alone to be witnessed by 100,000 to 120,000 spectators, every one of whom pays for his admission, and most of whom have undertaken a railroad journey of from 20 to 300 miles to be present at the game.

In the United States the interest in football is not less keen, but is more restricted, little interest being taken in any other matches than those between the great universities; but 30,000 to 40,000 spectators at one of these have been recorded. There is no national association. The governing body nearest approaching that definition is the 'Rules Committee' of the University Athletic Club of New York.

ASSOCIATION FOOTBALL. This, the oldest of the organized games, differs in almost every detail by which a score is made, from both 'Rugby' and the 'American' game. It is more showy and active; kicking the ball is the almost exclusive method of play, nobody but the goal-keeper being allowed to touch the ball with his hands. It follows that the ball must in a very short period be in play in many different parts of the field, and that the area of contest, and the exhibition of skill, strength, nerve, and agility, must shift rapidly from point to point. The game is played on ground not more than 200 or less than 100 yards in length, and not more than 100 or less than 50 yards in width. The limits are marked by a white line and flags. The side lines are known as 'touch lines,' the end lines as 'goal lines.' The goals are upright posts, eight yards apart, and a crossbar eight feet from the ground. The ball is round, 27 to 28 inches in circumference, and when first put in play weighing not more than 15 ounces. It must pass *under* the crossbar between the goal posts to score. Eleven players constitute a team, i.e. one goal-keeper, two full-backs, three half-backs, and five

forwards. The goal-keeper is in the most critical position; upon him in the last instance depends victory or defeat, and the laws leave him a wide margin in preventing a goal. The most widely essential quality in the association game is kicking of various degrees, from keeping the ball dribbling along at the player's feet until a favorable position is obtained, to sending it skying over half the field to his colleague, or keeping it low and swift, so as to pass under the goal bar.

'RUGBY' FOOTBALL is played by fifteen players on each side, on a field not exceeding 110 yards long and 75 yards broad. The boundaries are defined by white lines; the ends of the boundary are called goal lines, the sides touch lines. In the centre of each goal line two goal posts are placed, 11 feet high and 18 feet 6 inches apart, and joined by a crossbar 10 feet from the ground. Over the bar and between the posts the ball must be kicked to score a goal. The ball is oval, from 11 to 11½ inches long, 30 to 31 inches in long circumference, 25½ to 26 in widest circumference, and weighing from 13 to 14½ ounces. The choice of in-goals, or the kick-off, is tossed for; the game is started by a kick-off. A kick-off is a place kick (i.e. the ball is placed on the ground and kicked) from the centre of the field of play. The opposing side must not stand within 10 yards, or charge until the ball is kicked. At the time of the kick-off all the kicker's side must be behind the ball. The ball may then be kicked or picked up and run with by any player who is on-side (except that it must not be picked up when in a scrimmage, or it has been put down after it has been fairly held, or when it is on the ground after a player has been tackled—i.e. held by one or more players of the opposite side). It may be passed or knocked from one player to another. When it is firmly held the one in possession cries 'Down!' the forwards of either side hurry up and a scrimmage is formed, the eighteen packed tightly round the ball, every one trying either to force the ball out toward his goal, or to 'screw' his opponents—i.e. slide them off the ball, so that his own team keeps well on it. Two methods have developed from the early scrimmage, each unlawful, but each played so uniformly and universally as to have become unwritten laws—i.e. 'wheeling' and 'heeling.' In wheeling the ball is secured on the formation of a scrimmage and nursed, until the bias of the scrimmage is felt, either to the right or left; then the wheel is made on the most favorable side by the back row bringing the ball round to the front, while the front row slides off its adversaries. In 'heeling,' possession of the ball is obtained, as in wheeling; then the forwards mask their manœuvre by a feat of packing hard, and heel the ball out. When the scrimmage is broken up the players break away *en masse*, and follow the man who holds the ball at full speed, while the object of the holder is to transfer it to one of his own side who is in a more advantageous position than himself, either by dribbling the ball with the foot or passing it by hand. The ball is in touch when it goes, or a player carries it, across the side, or touch, lines. It then belongs to the side opposite that last touching it in the field of play, except when carried in. One of the side to whom it belongs puts it into play again by bounding it on the field at right angles to the touch line, and then running in with it, or passing it, or throwing it in;

or he scrimmages it at any spot at right angles with the touch line, between 5 and 15 yards from the place where it was in touch.

THE AMERICAN GAME. Founded upon the principles of English football, the American game has become by constant evolution radically different. It has always been distinctively a sport of the universities, colleges, and schools. Its development has been due entirely to the larger universities, notably Yale, Princeton, and Harvard. From the time the game was first played in the early seventies until the early nineties, these three held undisputed supremacy, and the subsequent general dissemination of knowledge of the finer points of play has been largely due to the instruction of coaches, themselves trained in the Yale, Princeton, or Harvard systems. Early in the nineties the University of Pennsylvania began placing strong teams in the field, and since then such institutions as Columbia, West Point, Dartmouth, Cornell, Lafayette, Amherst, and Annapolis in the East, and Michigan, Minnesota, Chicago, Illinois, Northwestern, Nebraska, California, and Leland Stanford, in the West, have become factors in the yearly struggle for intercollegiate honors. Broadly speaking, American football is mimic war. The fundamental principle of successful offensive play lies in the quick concentration of attack against the weakest point in the opposing team.

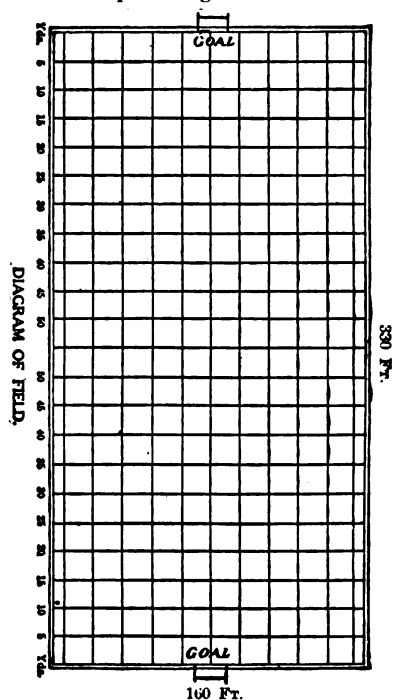
A team consists of eleven men: seven forwards and four backs. The forwards are the centre, the right and left guards, the right and left tackles, the right and left ends. The backs are the quarter-back, the right and left half-backs, and the full-back. The forwards, with the exception of the two ends, are selected for weight and strength. The ends must have speed and sufficient weight and strength to break up the opponents' end attack. The quarter-back, who usually directs the attack, must possess generalship, speed, and ability in handling the ball. The other backs are chosen for their ability in advancing the ball on the attack and in backing up their own forwards when on the defense. At least one man on the team must be proficient in kicking. This man should naturally be the full-back, although another back or even a forward may take the full-back's position.

The officials or judges governing play are the referee, the umpire, the timekeeper, and the linesmen. The referee's duty has to do primarily with the progress of the ball up and down the field; the umpire has to watch the players, inflicting penalties for any violations of the rules; the timekeeper keeps track of the passing time, allowing for delays when so directed; the linesmen, by means of tape and poles, measure accurately the exact advance of the ball.

A game of football consists of two halves of thirty-five minutes' actual playing time each, although by mutual agreement the captains of the opposing teams may decide upon a contest of shorter duration. Between the halves there is an interval of ten minutes for rest. Before beginning a game the two captains toss a coin, and the winner may choose the goal, giving the opponents the kick-off; or take the kick-off, giving the opponents choice of goal.

The field is three hundred and thirty feet in length and one hundred and sixty feet in width. At each end, in the middle, are the goal posts, consisting of two upright posts exceeding 20

feet in height and placed 18 feet, 6 inches apart, with horizontal crossbar 10 feet from the ground. The whole field is inclosed by heavy white lines marked in lime upon the ground. It is desirable



to have the field marked off with white lines every five yards, parallel to the goal line, for measuring the distance to be gained in order to retain possession of the ball; and, also, to have the field marked with lines, five yards apart, parallel to side lines, in order to assist the officials in deciding whether the first man who receives the ball crosses the scrimmage line a sufficient distance from where the ball is put in play.

Victory in a contest goes to the side scoring the greater number of points. Five points are given for a touchdown, made by carrying the ball over the opponents' goal line. A touchdown entitles the scoring side to a try at goal, which, if successful, counts an additional point. Previous to 1904 five points were allowed for a goal from field or a goal from placement, but in that year the value of this play was reduced to four points. A goal from field is made in the actual scrimmage. It must be a drop kick—that is, the ball must be dropped to the ground and propelled by the foot at the moment of rebound, and must pass directly over some part of the horizontal crossbar. A goal from placement may be made from the scrimmage or may be the result of a fair catch. A safety is scored when a player is forced to touch down the ball behind his own goal. In the first years of the game this play had no material penalty, but since the early eighties it has counted two points for the opponents.

When, after preliminary practice, the two teams have taken their positions on the field and the ball is placed on the ground in the exact centre, the referee blows his whistle for the game to begin. One of the side having the kick-off kicks the ball as far as possible towards the op-

ponents' goal. One of the opponents catches it and, protected by his fellows, runs back until he is tackled and thrown. If the man kicking sends the ball beyond the goal line and it is there touched down, it is brought out to the 25-yard line, where one of the other side may send it down the field by a free kick. After the kick-off, which takes place at the beginning of each half, and after a score has been made, the teams resort to the regular scrimmage play of attack and defense. To retain possession of the ball a side must advance it a certain number of yards within three downs. Failing in this the ball is given to the other side to attack under the same conditions. The two fundamental means of carrying the ball towards the opponents' goal line are by forcing it through the line of defending forwards or by carrying it around the end. The first play may be made successfully by quickly opening up a hole through which the man carrying the ball dashes, or by pushing and hauling him along by sheer weight and strength. When two teams are evenly matched and neither can gain ground with certainty by rushing, kicking is an important factor; e.g., if the first two downs have failed to gain enough ground to make the retention of the ball by rushing probable, the attacking side generally decides to kick rather than run the chance of yielding the ball to the opponents where it is. Then, too, there is the chance of regaining the ball after a kick through an opponent's fumble.

In order, as far as possible, to equalize the resources of attack and defense, a great number of rules have been introduced. The ball being put in play by the centre, who tosses it back between his legs to the quarter-back, the latter must pass it on to a third man. At least three men must touch the ball before it can be advanced by rushing beyond the line of scrimmage. A qualification of this rule, for the purpose of making a more open game, was introduced in 1903. This is commonly known as the "quarterback run," and allows the second man touching the ball to carry it forward, provided he crosses the line of scrimmage at least five yards outside of the point where the ball was put in play. For a punt or drop kick the ball may be passed directly from the snapper back.

An important feature of the American game is what is known as "interference." Interference is the protection rendered the man carrying the ball by his team-mates blocking off the men who are attempting to tackle and throw him. In doing this they are allowed to make use of their bodies but not of their arms.

For violations of the rules of the game there are a number of penalties. For off-side play or forward passing five yards are given to opponents; for holding or illegal use of hands or arms and for interference with an opponent trying to make a fair catch, fifteen yards. Unnecessary roughness or striking is punished by disqualification. When a player is injured or disqualified he may be replaced by a substitute.

The American game is governed by the Rules Committee, which consists of a representative each from Yale, Princeton, Harvard, Cornell, Pennsylvania, University of Chicago, and Annapolis. For years it has favored a more open game, which will be more attractive to the spectator, and which will still retain the basic principles of the sport.

The *Canadian* game, which is popular in a number of Provinces, is played on a field of 110 X 65 yards, with fifteen men on a team. The 'heeling out' of the ball is a feature of the game. Points may be scored in several ways, the playing of the game as well as its scoring partaking largely of the character of the English Rugby game. *Gaelic* football is a very old Irish game which has been revived in recent years. It is played by teams of from fourteen to twenty-one players, generally fifteen. Besides the usual goal posts, there are outer point posts, which give added opportunities for scoring. The teams line up for play in two parallel lines, the opponents holding hands. The ball is then thrown into the centre of the line, and the game begins at once. Having caught the ball, a player may advance it by kicking or by striking with the hand; but he may not throw or carry it. A resulting method of play is that of 'hopping,' by which the ball is kept bounding between the hand and the ground while the player rapidly advances down the field. The game is characterized by active playing and hard kicking.

Consult: Budd, *Football* (London, 1897); Camp, *How to Play Football* (New York, 1894); Camp and Deland, *Football* (Boston, 1896); Lewis, *Primer of College Football* (New York, 1896); Robinson, *Rugby Football* (London, 1896); Shearman, *Athletics and Football*, Badminton Library (London, 1887), or "The Ethical Functions of Football," by Thwing, in the *North American Review* for November, 1901.

FOOTE, ANDREW HULL (1806-63). A distinguished officer of the United States Navy. He was born in New Haven, Conn., on September 12, 1806, the son of Samuel A. Foote (q.v.); studied at West Point for several months, and became acting midshipman in the navy on December 4, 1822. He was commissioned lieutenant on May 27, 1830; from 1837 to 1840 was executive officer of the *John Adams*, of the East India Squadron, during its cruise around the world, and from 1841 to 1843 was stationed at the Naval Asylum in Philadelphia, of which during the last two years he was in full charge. He was executive officer of the Boston Navy Yard from June, 1846, to June, 1848, and from 1849 to 1851, as commander of the brig *Perry*—his first independent command—cruised along the African coast for the purpose of protecting American commerce and suppressing the slave trade. In December, 1852, he was promoted to the rank of commander. After four years of shore duty he was appointed to the *Portsmouth*, April 5, 1856, and was ordered to join Commodore Armstrong's fleet on the East India Station. On arriving at Canton he established fortified posts on shore for the protection of American residents; but Commodore Armstrong soon afterwards ordered that the American marines be withdrawn, and while Foote was making arrangements to this end he was fired on from the so-called Barrier Forts (q.v.), which he stormed and captured a week later, acting under Armstrong's orders. Soon after his return—in October, 1858—he was appointed commandant of the Brooklyn Navy Yard, which position he relinquished, with the rank of captain, in August, 1861, soon after the beginning of the Civil War, to accept the command of the naval operations in Southwestern waters. On September 6, 1861, he assumed command at Saint Louis,

and for some time devoted himself with great energy to the task of preparing his flotilla for action. On February 6, 1862, he captured Fort Henry, and on the 14th he attacked Fort Donelson, before which Grant with his army had arrived two days earlier; but was repulsed, and he himself was wounded. (See FORT HENRY AND FORT DONELSON.) Island No. 10 (q.v.), after a siege by Foote and the forces under Pope, surrendered on April 7. On May 9, his wound having become serious, Foote left the command of the fleet in the hands of Capt. Charles H. Davis, and on July 17, 1862, at his own request, was formally detached from the Western Flotilla. He had become a flag officer in November, 1861, and on July 16 was promoted to be a rear-admiral. For several months in 1862-63 he was chief of the Bureau of Equipment and Recruiting, and on June 4, 1863, was appointed to succeed Rear-Admiral Dupont as commander of the fleet off Charleston, but died at New York, on June 26, while on his way to assume the duties of his new position. Foote published a book entitled *Africa and the American Flag* (1854), based largely on his African cruise of 1849-51. Consult Hoppin, *Life of Rear-Admiral Andrew Hull Foote* (New York, 1874).

FOOTE, ARTHUR (1853—). An American composer, born at Salem, Mass. He studied piano and harmony with Stephen A. Emery, and subsequently at Harvard University (class of 1874) with John K. Paine, continuing for a year after graduation. He was leader of the Glee Club and also chorister, his first published composition being the class-day song. On leaving college he studied piano and organ playing with B. J. Lang, and shortly afterwards settled in Boston. He gave many pianoforte and organ recitals there and elsewhere. His first composition performed in public was a gavotte, which Madame Essipoff played in a so-called 'American' concert in Boston in 1877. His first larger composition to have success was the *trio* in C major for piano and strings, about 1883. His compositions include works for orchestra (*Serenade* in E major for strings; overture, *In the Mountains*; prologue, *Francesca da Rimini*; suite in D minor); chamber music; chorus and orchestra (*Wreck of the Hesperus*; *Skeleton in Armor*; *Farewell to Hiawatha*); much church music, organ and piano pieces; and about sixty songs, among them the popular *Irish Folk-Song*; *I'm Wearing Ava*; *In Picardie*; *O Swallow, Swallow*; and *On the Way to Kew*. Foote's work has been rather more along classical lines (so called) than in the romantic school, but a tendency toward the latter showed itself in his later compositions.

FOOTE, HENRY STUART (1800-80). An American politician, born in Fauquier County, Va. He graduated at Washington College, Lexington, Va., in 1819, and after studying law and being admitted to the bar in 1822, removed in 1824 to Tusculum, Ala., where he practiced his profession and edited a Democratic newspaper. Two years later he removed to Jackson, Miss. He soon became a leader of the Democratic Party in his State, allying himself at first with the extreme States Rights branch. In 1847, however, he became a pronounced Unionist, and after a sharp contest was elected, in 1847, to the United States Senate. He favored the annexation of Cuba, Yucatan, and

Mexico, declaring that only thus could the continued possession of California and Oregon by the United States be assured. He was the author of the proposal for a grand committee of thirteen, which, after Webster had spoken in its favor, was accepted. It was this committee with Clay as its chairman that drew up the famous compromise measures. Later he introduced the 'finality resolutions,' by which the compromise laws were declared to be a "final settlement of all controversies growing out of slavery." In 1852 he resigned his seat in the Senate to enter the contest for Governor of Mississippi as the Unionist candidate in opposition to John A. Quitman, the leader of the Secessionist party. Quitman, soon realizing that there was no chance of his own election, withdrew in favor of Jefferson Davis, in spite of whose personal popularity, however, Foote was elected. On the conclusion of his term as Governor, Foote removed to California, but returned to Mississippi in 1858, and again entered the fight against the secession movement, participating in the Southern Convention at Knoxville, Tenn., in 1859, as one of the strongest opponents of disunion. Settling in Nashville, in spite of misgivings, he cast in his lot with the Confederacy upon the secession of Tennessee, and was chosen a member of the first and second Confederate Congresses. His personal attacks on Jefferson Davis, his old rival, were bitter and scathing. He was in Washington even before Lee's surrender, and after the restoration of peace, remained in that city, where his counsel was sought by the Northern leaders in regard to reconstruction matters. He became a strong supporter of Grant, whose Southern policy he favored, and by whom he was made director of the United States Mint at New Orleans, which position he held until shortly before his death. He published *Texas and the Texans* (1841); *History of the Southern Struggle* (1846); *History of the Civil War: or, Scylla and Charybdis* (1867); and *Personal Reminiscences*.

FOOTE, MARY HALLOCK (1847—). An American artist and novelist, born in Milton, N. Y., November 19, 1847. She studied art in New York, and in 1876 married Arthur D. Foote, a mining engineer. Since then she has lived in California, Colorado, and Idaho, which have given themes for her novels and drawings. She has also furnished elaborate illustrations for Longfellow's "Skeleton in Armor," and "The Hanging of the Crane." Representative of her fiction are: *The Led Horse Claim* (1883); *The Last Assembly Ball* (1889); *John Bowdoin's Testimony* (1886); *Cœur d'Alène* (1894); *The Chosen Valley* (1892); *In Exile* (1894); and *The Cup of Trembling* (1895). In all these the scenes are taken chiefly from Rocky Mountain country.

FOOTE, SAMUEL (1720-1777). An English actor and playwright, born at Truro, in Cornwall. In 1737 he entered Worcester College, Oxford, but left without a degree, and proceeded to the Temple. His fortune soon dissipated at the London coffee-houses, he turned to the stage for a means of support (1744). In 1747, with a piece entitled *Diversions of the Morning*, he opened the Haymarket Theatre, where he was at once director, actor, and dramatic author. In this and other pieces he introduced well-known living

characters, and by his admirable powers of mimicry succeeded in drawing large audiences, till the theatre was closed by order of the magistrates. He, however, managed to continue his dramatic performances by calling them 'teas.' These 'teas' closed in 1753, and Foote returned to the regular stage, writing and adapting many plays, and acting in many parts, in London, Dublin, and Edinburgh. In 1766 he broke his leg by a fall from his horse, and amputation was found necessary. Full of resources, he turned the incident to account on the stage, composing parts expressly adapted to his own state. He died October 21, 1777. Among his plays are *The Minor*, *The Liar*, and *The Mayor of Garratt*. Foote had a great reputation as a wit. His *Works* were edited by John Bee (Badcock) (London, 1830). Consult Cook, *Memoirs of Samuel Foote, with a collection of his bons mots* (London, 1805).

FOOTE, SAMUEL AUGUSTUS (1780-1846). An American politician, born in Cheshire, Conn. He graduated at Yale in 1797, and practiced law. After serving for some time in the Legislature he was at different times sent to Congress as a Whig (1819-27). During the following six years he was in the Senate. He was the author of the resolution 'on public lands,' which provoked the great debate between Senator Hayne of South Carolina and Webster of Massachusetts.

FOOT GUARDS. Select regiments of infantry, organizations common to European armies. In the British Army it includes the First, Second, and Third battalions of Grenadier Guards (q.v.), the First, Second, and Third battalions of Coldstream Guards (q.v.), the First, Second, and Third battalions of Scots Guards, and the Irish Guards, the First Battalion of which was formed in 1902. Like the German guard-corps, they are not locally distributed throughout the Empire, but have permanent stations. See **HOUSEHOLD TROOPS**.

FOOTMAN MOTH. A name among British lepidopterists for the small yellowish gray moths of the family Lithosiidæ, allied to the tiger-moths.

FOOT-POUND. The unit of work (q.v.) in the foot-poundal system, and corresponding to the amount of work required to raise one pound one foot vertically against the force of gravity at sea-level in latitude 45°. See **MECHANICAL UNITS**.

FOOTPRINT, FOSSIL. See **FOSSIL**; **ICHOLOGY**.

FOOT-ROT. A hoof-disease of sheep. Two varieties are recognized, the commoner consisting of an excessive growth of hoof, which at the toe, or round the margin, becomes turned down, cracked, or torn, and thus affords lodgment for sand and dirt. Irregular wearing of the hoof is the cause, and hence the prevalence of foot-rot in soft rich pastures, and especially among sheep previously accustomed to bare, rough, or upland walks, where the hoof is naturally worn down by the greater amount of walking necessary to procure sustenance. Taken in time, when lameness is first apparent, and before the hoof is cracked, and the foot inflamed, a cure rapidly follows the careful paring of the superfluous and diseased hoof; indeed, further treatment is scarcely necessary, unless the vascular parts have been laid bare, when a little tar may be applied as a mild

astringent and protection from flies. When, from inattention or neglect, the hoof is separated from the sensitive parts beneath, when ulcers appear on the sole, or proud flesh develops, active astringents or mild caustics are necessary. Butter of antimony, diluted with an equal quantity of tincture of myrrh, is a good remedy when cautiously and temperately used. A convenient paste, which in inexperienced hands is safer than a fluid caustic, may be made with equal weights of flowers of sulphur and finely powdered sulphate of copper, rubbed up to the needed consistency with lard or oil. Many have great faith in a mixture of this salt of copper with gunpowder and lard. The second and more troublesome variety is allied to what is termed 'foul in the foot'; instead of commencing at the ground surface, it begins in the interdigital space or at the coronet, and is contagious. The foot is hot, tender, and swollen around and immediately above the coronet. There are ulcerations in the interdigital space, and the swelling, and subsequently the appearance of proud flesh, cause a separation of the toes. When the tenderness and heat are great, poultices are advisable; but in the milder cases and earlier stages, the parts should be well washed with a solution containing to the pint of water half an ounce each of sulphuric acid and oil of turpentine. When ulcers appear, they must be touched with lunar caustic, or dressed with the paste already recommended. In the treatment of contagious foot-rot preference should be given to antiseptic solutions.

FOOTWALL. A term used in mining, to indicate the lower wall of an inclined ore body or coal seam. It underlies the ore body immediately and often serves as a slanting floor on which tracks can be laid for hauling up the ore. See **HANGING WALL**; **MINTING**.

FOOT-WASHING. An Eastern custom of very early times, having its origin in necessities produced by climate and modes of dress, and in the obligations attached to the rites of hospitality. In the most primitive times the feet were without covering, and sandals afforded protection only to the sole. Consequently, after any journey in the heat and sand, bathing the feet, if not absolutely required, was at least convenient and refreshing. From Scripture and other sources, we learn that the servants of a household were accustomed to perform this work for the guests, and thus it became a significant sign of hospitality. In memory and imitation of the example of Christ at the Last Supper (John xiii.), the earliest Christians were accustomed to regard it as a praiseworthy act of piety. By the end of the fourth century it was specially connected with the observances of the Thursday before Easter, when, at least in the churches of Africa, Gaul, and Milan, it was the custom for the bishop to wash the feet of the newly baptized with solemn ritual observances. When infant baptism became the rule, foot-washing was dissociated from the administration of the sacrament; but as a liturgical custom observed on Maundy Thursday, it became more and more generally practiced. Earlier editions of the *Ordo Romanus* do not mention it, but the later ones speak of the Pope performing the ceremony for twelve subdeacons. As in monasteries where was a twofold observance, by the brethren among themselves

and by the abbot and others for numerous poor people, so the Pope and other bishops added the washing of the feet of representative poor men, who also received food and gifts. It was also frequently, and is still in some courts (e.g. that of Vienna), practiced by monarchs. At Rome, while the Gospel narrative is sung (from whose first words in Latin, *Mandatum novum*, 'a new commandment,' John xiii. 34, the name of Maundy or Mandate Thursday is derived), the representatives of the Apostles take their seats, dressed in white woolen tunics, and the Pope, in similar attire, sprinkles a few drops of water on the right foot of each, then wipes and kisses it. After this a repast is given, at which the Pope and his Cabinet wait on the old men, who, at the close, take with them the tunics and towels, with the addition of a small gratuity in money. The Anabaptists, at the Reformation, continued the practice. The Moravians revived it, but without strictly enforcing it. In modern times it has been regularly practiced among the Dunkers (see GERMAN BAPTIST BRETHERN), Winebrenerians, and the Glassites or Sandemanians.

FOPPA, fôp'pâ, VINCENZO (called Il Vecchio) (?-1492). An Italian painter, born at Brescia. He was a pupil of Squarcione. Little is known of his life until he went to Milan, where he executed many important works. These were generally in fresco, and are now destroyed. Among them was a series of scenes from the life of Trajan, done about 1456. Foppa is generally considered the founder of the Milanese School. The pictures that remain of this uncommon and interesting master are very few; the best of them are: "Saint Jerome Praying," and a "Crucifixion," both at Bergamo; a fine altar-piece in Santa Maria di Castillo, Savona; "Saint Sebastian," and some fragments of fresco at the Brera in Milan; and "The Adoration of the Kings," in the National Gallery, London. The last years of his life were spent at Brescia, whither he returned in 1489.

FOPPINGTON, LORD. An ostentatious, ridiculous man of fashion in Vanbrugh's *Relapse*. He also appears in Cibber's *Careless Husband*, and in Sheridan's *Trip to Scarborough*, an adaptation of Vanbrugh's comedy. The character was suggested by Sir Novelty Fashion in Cibber's *Love's Last Shift*. Cibber himself created the rôle and made his reputation with it.

FORAGE (in agriculture). See FEEDING STUFFS.

FORAGE (OF. *fourage*, Fr. *fouirage*, from OF. *forrer*, to forage, from *forre*, *fuerre*, Fr. *feurre*, from ML. *fodrum*, forage, from *voder*, AS. *fôdor*, Eng. *fodder*, OHG. *fuotar*, Ger. *Futter*, food; connected also with AS. *fôda*, Eng. *food*, and with Gk. *παρέσθαι*, *patēsthai*, to feed). In military usage, the fodder issued by the Government for animals, the property of the State. In the United States Army, the forage ration for a horse, as provided in the Army Regulations, is 14 pounds of hay and 12 pounds of oats, corn, or barley; it being left to the department commander to reduce the ration when necessary. Where grazing is practicable, or when little labor is required, commanding officers are authorized to order a judicious reduction of the allowance. Forage is furnished only to officers for the horses owned and actually kept by them in the per-

formance of their official duties when serving with troops in the field or at military posts and stations.

FORAGING ANT. An ant of the Central American genus *Eciton*, usually called army ants in Nicaragua, because they go about in large bodies, making forays upon insects and other small animals. These columns may be three or four yards wide, and include many thousands of individuals. As they march forward smaller columns are pushed out ahead or on the flanks, which find and flush the prey. Larger animals flee; insects try to leap away, but more often jump into the midst of the ants, and even the largest are soon overpowered and torn to pieces. The ants explore thickets and brush-heaps, driving everything to the twigs and then catching and pulling them down; but spiders often escape by letting themselves hang by a silken thread. Birds accompany such a foray through the forest, and dart at the escaping insects, but do not eat the ants. Several species of *Eciton* inhabit the American tropics, one of which devotes its excursions to harrying the nests of a certain small and timid ant (*Hypoclinea*), which it ousts from its galleries and robs of pupæ and larvæ, but does not otherwise injure. "The moving columns of *Ecitons* are composed almost wholly of workers of different sizes, but at intervals of two or three yards there are larger and lighter-colored individuals that will often stop, and sometimes run a little backward, halting and touching some of the ants with their antennæ. They look like officers giving orders and directing the march of the column."

These ants are of various species and differ in size, food, and methods of foraging. The *Ecitons* are remarkable in having no permanent home. On the contrary, they make a temporary habitation in some hollow under a log, or in the ground, where great masses cluster together like a hanging swarm of bees, in the centre of which the larvæ and pupæ are kept warm. These, with their nurses, seem to occupy a chamber within a living nest, and tunnel-like entrances are kept open along which food is carried by those left at work outside. No ants show a greater sense of organization and mutual helpfulness than do these, and they seem to stand at the head of the tribe in point of intelligence. A circumstantial account of several species is given by Belt, in his *Naturalist in Nicaragua* (London, 1888), from which the sketch here given has been condensed.

FORAKER, JOSEPH BENSON (1846—). An American politician and legislator, born at Rainboro, Highland County, Ohio. In 1862, at the age of sixteen, he enlisted as a private in the Eighty-ninth Ohio Volunteer Infantry, and at the close of the war received the brevet rank of captain. Immediately after the close of hostilities he entered the Ohio Wesleyan University at Delaware, Ohio, and two years later entered the junior class at Cornell University, where he graduated in 1869. He studied law and was admitted to the bar at Cincinnati, where he practiced with success until 1879, when he was elected a judge of the Superior Court. He resigned from the bench in 1882, and in 1885 was elected Governor of Ohio on the Republican ticket. He was reelected in 1887, and was de-

feated for a third term, in 1889, by James E. Campbell, although all the rest of the Republican State ticket was elected. From his defeat as Governor in 1889 to 1897 he was engaged actively in the practice of law at Cincinnati, gaining a reputation as a corporation attorney. In 1897 he became United States Senator. In the Senate he immediately took an active and aggressive part in the debates, being one of the most radical advocates in that body of the war with Spain in 1898.

FORAMINIFERA (Neo-Lat. nom. pl., from Lat. *foramen*, hole + *ferre*, to bear). A name given by the French zoölogist D'Orbigny, in 1826, to a group of minute animals, which at that time were regarded as mollusks, because of their remarkable and beautiful shells. They were even ranked with the cephalopods because many of them possess shells spirally coiled, like that of the nautilus. In 1835, however, Dujardin recognized their true nature, and since his day the Foraminifera have been considered a subdivision of the Protozoa. They are now ranked as an order of Rhizopoda (q.v.), distinguished from the amoeba and its near allies by the form of the pseudopodia, which are very extensile and thread-like, and are constantly anastomosing so that they form a beautiful network of granular protoplasm. Another feature which serves to distinguish the Foraminifera is the presence of a shell, although not all rhizopods which have shells are of this order. The shell or 'test' of the Foraminifera may be chitinous, or calcareous, or arenaceous (that is, made up of particles of sand, mud, sponge-spicules, or other foreign material firmly glued together), but it is never siliceous. The shells are distinguished as 'perforate' or 'imperforate,' according as they have their walls penetrated, or not, by minute openings or canals through which the pseudopodia project. In nearly all cases there is a large opening through which the animal within the shell comes in contact with the surrounding water, and often there are two or more of these 'general apertures.' In the imperforate forms, the pseudopodia are extended only through these general apertures. The Foraminifera with chitinous shells are all *Imperforata*; those with arenaceous shells are usually *Imperforata*, but there are many perforate forms; those with calcareous shells show two very distinct sorts of tests, one group having them white, opaque, like porcelain, and imperforate, while the other has them transparent, glassy, and perforate. Marking or sculpturing of the surface of the shell is very common in both groups. In regard to the form of the shell we find a most extraordinary variety, but the most important point is whether they are monothalamous (unilocular), that is, composed of a single chamber; or polythalamous (plurilocular), that is, made up of several or many chambers. The latter forms arise by budding, from a single chamber, the buds remaining attached to the parent. Now since the monothalamous shells may be spherical, ovate, spindle-shaped, star-shaped, or tubular (straight, curved, or coiled) and symmetrical or quite asymmetrical, it follows that the polythalamous shells may be very complex and irregular. They are often very beautiful and sometimes reach a considerable size. The great majority of the Foraminifera are known by their shells alone, compara-

tively little being known of the animals themselves. In those which are known the contractile vacuole is wanting, and even the nucleus is usually indistinguishable, so that their structure would seem to be extremely simple.

In regard to their physiology we know that food is taken into the body in the form of minute organic particles, by means of the flowing or streaming movements of the protoplasm which makes up the pseudopodia. In addition to this food it is possible that some organic matter in solution in the water is also absorbed and used, for the ability to take carbonate of lime in solution and make use of it to form their shells is one of the most characteristic and obvious features of these animals. Their methods of reproduction are only partially understood. The processes of fission and of budding are constantly going on. In certain forms, reproduction takes place by the formation of spore-like young. These exceedingly minute germs move about by a single flagellum. Such a flagellum-bearing embryo is called a 'flagellula.' The Foraminifera are chiefly marine animals, but those with chitinous shells are found mostly in fresh water. They are all very small, practically microscopic, though the white shells of many of the marine forms are large enough to be seen with the naked eye; quite a number are from one to two millimeters in diameter, and the well-known genus *Orbitolites* has a polythalamous shell, sometimes 20 millimeters across, while *Nummulitis* is an inch in diameter.

The shells of Foraminifera are found all over the ocean floor except in the Arctic regions, and in many places form deposits of great extent and thickness. It was formerly supposed that the animals lived swimming about in the sea, and that it was only at death that the shells sank to the bottom, but it is now known that comparatively few species are pelagic, and it is probable that most species live on the bottom throughout life. Geologically, the Foraminifera occur from Cambrian times down to the present, though they have been most abundant apparently since the close of the Paleozoic era.

The classification of the Foraminifera is a matter of unusual difficulty, owing to the very great individual variation that occurs in the form and appearance of the shell. It is very doubtful whether the 'species' of this order are comparable with the species of higher groups, since little is known in regard to their reproduction and limits of variation. Ten families are now generally recognized, the lines of division being based on the composition of the shell, whether polythalamous or not, whether perforate or not, and on the relative arrangement of the chambers. The best-known families are the Gromidæ, which includes the fresh-water forms, of which Gromia and Microgromia are familiar examples; the Miliolidæ, including the huge *Orbitolites*; the Globigerinidæ, with the widespread *Globigerina*; and the Nummulinidæ, including the well-known and characteristic fossil forms *Fusulina* and *Nummulites*.

FOSSIL FORAMINIFERA. The oldest known Foraminifera appear in the Lower Cambrian rocks of the Province of New Brunswick, Can., where occur some minute spherical shells that cannot be distinguished in respect of either size, form, or microscopic structure from the modern spe-

cies *Orbulina universa*. Associated with these are species of *Globigerina*, very like those of modern times. Many Foraminifera are scattered through the overlying formations up to the Carboniferous system, where they suddenly appear in great abundance. Whole beds of limestone in Europe, Asia, Japan, and North America are formed by the closely crowded shells of the genera *Saccamina*, *Endothyra*, *Fusulina*, and *Schwagerina*. The two latter genera are not found above the Permian. Other extinct genera in the Carboniferous rocks are associated with species of genera that are still living in the Atlantic Ocean and the Mediterranean Sea. The Mesozoic rocks have also their Foraminifera in abundance. The genera of the family *Lagenidæ* are predominant in the Liassic and Jurassic systems. The chalk deposits of the Cretaceous age of Europe and America consist largely of foraminiferan shells (especially *Globigerina* and *Rotalia*), together with spicules of sponges. The members of the order reached their greatest development in Tertiary time, though most of the genera and species found in the rocks of that period are still living in the modern seas. The majority of these were more abundant in the earlier period than they are now. Certain other forms, like *Orbitoides* allied to *Nummulites*, are restricted to rocks of Tertiary age. *Nummulites* (q.v.) is an important index fossil of the Eocene series, in which its coin-shaped shells constitute great limestone beds in the Alps and Egypt.

The well-known *Eozoön* (q.v.), found in Laurentian limestones in Canada, has long been considered by some authors to be the oldest foraminifer, and likewise the oldest known fossil organism. Careful investigation has proved it to be a mineral concretion.

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FORBACH, förbâg. A town in Lorraine, Germany, on an affluent of the Rossel, five and one-half miles southwest of Saarbrücken (Map: Germany, B 4). Glass, soap, and pasteboard are its manufactures. The place is mentioned as early as the tenth century under the name of Furfac. After the battle of Spichern, fought on the neighboring heights, August 6, 1870, the town was occupied by the victorious German troops. Population, in 1890, 9575; in 1900, 8209.

FORBES, förbz, ALEXANDER PENROSE (1817-75). Bishop in the Episcopal Church of Scotland. He was born in Edinburgh, and studied at the Edinburgh Academy, and under Rev. Thomas Dale, the poet, in Kent; he also attended the Glasgow University (1833), and won distinction as an Oriental scholar. In 1836 he obtained an appointment in the Indian civil service, and left England for Madras. Returning to his native country in 1839, he obtained a Sanskrit scholarship in Brasenose College. At Oxford he became associated with Pusey, Newman, and Keble; and in 1844 was ordained deacon and priest in the Church of England, and held a curacy. In 1846 he returned to Scotland for a while, but afterwards became Vicar of Leeds (1847). After the death of Bishop Moir, he was called to the See of Brechin (1848). In 1860 he was prosecuted for heresy, because he inculcated the doctrine of the Real Presence, but he made a powerful defense, and was acquitted with censure and admonition. His *Short Explanation of the Nicene Creed* (1853), and *Explanation of the Thirty-nine Articles* (1867-68), and various commentaries, reviews, etc., were highly esteemed. He edited the original lives of Saint Ninian, Saint Kentigern, and Saint Columba in the *Historians of Scotland*, vols. v. and vi. (Edinburgh, 1875); also *The Kalendars of Scottish Saints* (1872). He died at Dundee, Scotland, October 8, 1875. Consult Mackey, *Bishop Forbes: A Memoir* (London, 1888).

FORBES, ARCHIBALD (1838-1900). An English journalist. He was born in Morayshire, Scotland, in 1838. He studied at the University of Aberdeen; served for some years in the Royal Dragoons; and then became special correspondent for the *London Daily News*, in which capacity he accompanied the Prussian Army during the Franco-German War; witnessed the close of the Commune; visited India during the famine of 1874; accompanied the Prince of Wales on his tour through India (1875-76); and was in the Carlist War in Spain, the Servian War, and the Russo-Turkish War of 1877, etc. He lectured in Great Britain, the United States, and Australia. Among his many works are a military novel called *Drawn from Life* (1870); *My Experiences in the Franco-German War* (1872); *Life of Chinese Gordon* (1884); *William I. of Germany* (1888); *The Afghan Wars* (1892); *Tzar and Sultan* (1894); *Napoleon III.* (1898). He died March 30, 1900.

FORBES, DUNCAN, of Culloden (1685-1747). A Scotch judge and patriot, born November 10, 1685, probably at the family seat near Inverness. He was educated at Inverness Grammar School, and after completing his studies at the universities of Edinburgh and Leyden, became advocate at the Scottish bar in 1709. Through family influence he was soon appointed Sheriff of Midlothian, and rapidly acquired political power and a lucrative practice. In 1722 he became member of Parliament for Inverness; in 1725 was appointed Lord Advocate; and in 1737 reached the summit of his profession as Lord President of the Court of Session. His loyalty to the English Crown had been conspicuous in the Rebellion of 1715, and at the outbreak of 1745 he hastened north, and by his presence and influence did much to counteract the uprising. For advocating and exercising humanity toward the rebels he was accused as a suspect by Lord Lovat, who at-

tacked Culloden House, his residence, but was spiritedly beaten off by the President and his people. The rebellion spread, and Forbes fled for refuge to the island of Skye. After the battle of Culloden, he returned and zealously discharged his duties until he died, December 10, 1747. He was the author of some important theological works. Consult: Duff, *Memoir* attached to the *Culloden Papers* (London, 1815); Bannatyne, *Memoir* attached to *Works of Duncan Forbes of Culloden* (Edinburgh, 1816); and Burton, *Lives of Simon, Lord Lovat, and Duncan Forbes of Culloden* (London, 1847).

FORBES, EDWARD (1815-54). An English zoölogist. He studied medicine and other sciences in Edinburgh and Paris, and in 1841 became naturalist of the surveying ship *Beacon* during a voyage to Asia Minor. In 1843 he became professor of botany at King's College, London; in 1852 professor of natural history at the School of Mines, and president of the Geological Society; in 1853 professor at Edinburgh. He was a brilliant and voluminous writer. Important among his works are *History of British Starfishes* (1841); *History of British Mollusca* (with Hanley, 1853). Consult Wilson and Geikie, *Memoir of Edward Forbes* (Edinburgh, 1861).

FORBES, EDWIN (1839-95). An American artist, born in New York, and a pupil of A. F. Tait. He was special artist for *Frank Leslie's Magazine* during the Civil War, and the etchings he did at this time were given by General Sherman to the Government, and are now in the War Office at Washington. They are of historic value. Afterwards he painted landscape and cattle scenes, among which are "Orange County Pasture" (1879) and "Evening—Sheep Pasture" (1881). In 1877 he was made an honorary member of the London Etching Club.

FORBES, GEORGE, Earl of Granard (1685-1765). See GRANARD.

FORBES, HENRY OGG (1851—). A Scotch traveler, born at Drumblade. In 1878-83 he made extensive scientific travels through Sumatra, Java, Timor, and other islands of the East Indies. In 1885 and 1886 he explored British New Guinea. He was elected a fellow of the Zoölogical Society of London and of the Royal Geographical Society, and appointed director of the Free Public Museums of Liverpool. He published *A Naturalist's Wanderings in the Eastern Archipelago: A Narrative of Exploration and Travel from 1878 to 1883* (1885).

FORBES, JAMES DAVID (1809-68). A Scotch physicist and geologist. He was educated at the University of Edinburgh with a view to the law, but his natural inclinations led him to the study of physics. At the age of nineteen he was elected to membership in the Royal Society of Edinburgh, and five years later succeeded Sir John Leslie as professor of natural philosophy in the university, although opposed by Sir David Brewster. His studies on thermal radiations resulted in the important discovery of the polarization of heat, for which the Royal Society of London awarded him the Rumford medal. While traveling in the Alps, Forbes collected a vast amount of information bearing on the origin and movement of glaciers, and his book, which appeared in 1843, was the most valuable contribution on glacial phenomena that had been published up to that time. His investigations were

limited to the collection and arrangement of reliable data, but they were the means of overthrowing many crude conceptions and of directing future studies in the proper channels. Forbes received the degree of LL.D. from the University of Edinburgh, and was elected to membership in the Royal Society of London, the Geological Society, and many foreign scientific societies, including the Institute of France. He contributed a great number of scientific papers to the *Proceedings* of the Royal Society of Edinburgh. His more extended publications are: *Travels Through the Alps of Savoy and Other Parts of the Pennine Chain, with Observations on the Phenomena of Glaciers* (1843); *Norway, and Glaciers Visited in 1851* (1853); and *A Tour of Mont Blanc and Monte Rosa* (1855).

FORBES, JOHN (1710-59). A Scotch soldier, who served in America during the French and Indian War. For some time he was a physician in Scotland, but subsequently entered the army, served in the War of the Austrian Succession, became a colonel in 1757, and served for a time as quartermaster-general under the Duke of Cumberland. In December, 1757, he was sent to America as brigadier-general for service against the French and Indians, accompanied the Louisburg expedition as adjutant-general early in 1758, and in the summer of that year led the force of between six and seven thousand, which marched across Pennsylvania, and on November 25 took possession of Fort Duquesne, which had been evacuated by the French on the preceding day. In March, 1759, Forbes, who had been dangerously ill through the expedition, died in Philadelphia. Consult Parkman, *Montcalm and Wolfe* (Boston, 1884).

FORBES, Sir JOHN (1787-1861). A Scotch physician, born at Cuttlebrae, Banffshire. He studied at Aberdeen from 1805 to 1807, and from the latter year to 1816 acted as assistant surgeon in the navy. In 1817 he graduated in medicine at Edinburgh, then practiced his profession at Penzance and Chichester until 1840, when he removed to London. He was for years physician to the Queen and Prince Consort, and was knighted in 1853. He was a fellow of the College of Physicians and the Royal Society of London, and a member of numerous foreign societies. Jointly with Drs. Tweedie and Conolly, he edited the *Cyclopædia of Practical Medicine* (4 vols., 1832-35). In 1836 he founded the *British and Foreign Medical Review*, which he carried on for twelve years. In 1831 he published the first edition of his translation of *Lænnec's Treatise on Auscultation* (5th ed. 1838). Among his other works are: *Physician's Holiday* (1849); *Memoranda Made in Ireland* (1852); *Sightseeing in Germany and the Tyrol* (1856); *Nature and Art in the Cure of Diseases* (1857).

FORBES, JOHN MURRAY (1807-85). An American clergyman. He was born in New York, and graduated at Columbia College in 1827, and at the General Theological Seminary in 1830. He was ordained to the Episcopal ministry in the same year, and in 1834 became rector of Saint Luke's Church, New York, also acting for a time as professor of pastoral theology in the seminary. In 1849 he became a Roman Catholic, and after reordination was appointed pastor at Saint Ann's Church, New York, where (having been married before his conversion) he presented the

unique spectacle of a Catholic priest attended at the altar by his sons. In 1859 he returned to the Episcopal Church, and from 1869 to 1872 was dean of the General Theological Seminary.

FORBES, JOHN COLIN (1846—). A Canadian artist, born at Toronto. He was already proficient in his art before he went to London, where he studied at the Royal Academy, and afterwards in Europe. He settled in New York City. Among his works are the "Mount of the Holy Cross"; "The Foundering of the *Hibernian*"; "The Glacier of the Selkirk," and many portraits, including those of the Marquis of Dufferin, Gladstone, Sir Charles Tupper, and Sir John A. Macdonald.

FORBES, STANHOPE A. (1857—). An English genre painter, born in Dublin. He studied under Bonnat in Paris, and in 1889 received a first-class medal at the Paris Exposition. Among his works exhibited at the Royal Academy are: "The Fish Sale"; "By Order of the Court"; "Forging the Anchor"; and "The Village Philharmonic Society," bought by the Corporation of Birmingham. He is noted for his interior effects, which show much cleverness in the treatment of light.

FORBES, Sir WILLIAM, of Pitsligo (1739-1806). A Scottish banker and writer, born at Edinburgh. He was educated at Aberdeen. In 1761 he was admitted as a partner in the bank at Edinburgh of Messrs. John Coutts & Co.; and two years later a new company was formed, of which he ultimately became the head. In 1781 he purchased the estate of Pitsligo, Aberdeenshire, which had been forfeited by Lord Forbes of Pitsligo for taking part in the Rebellion of 1745. He introduced the most extensive improvements on it, and laid out and built the village of New Pitsligo. He was a member, with Johnson, Burke, Garrick, Reynolds, and others, of the celebrated Literary Club of London, was a friend of Dr. Beattie, the poet, and published *An Account of the Life and Writings of James Beattie, including many of his Original Letters* (2 vols. 1806). He also wrote the *Memoirs of a Banking House* (1803). His bank became, in 1838, the Union Bank of Scotland.

FORBES-ROBERTSON, JOHNSTON (1853—). An English actor, born in London. He early won some success as a painter, but went upon the stage when he was twenty-one years old, and has since been a member of various companies, including those of Sir Henry Irving and Sir Squire Bancroft. Some of his best-known performances have been those with Mrs. Patrick Campbell, in *The Notorious Mrs. Ebbsmith*, at the Garrick in 1895, and a little later as Romeo to her Juliet, at the Lyceum, where he assumed the management late in that year; as Constantine in *Coppée's For the Crown* (1896); and in 1897 as Hamlet, his best Shakespearean part.

FORBIDDEN FRUIT. A name fancifully given to the fruit of different species of the genus *Citrus*. In the shops of Great Britain, a small variety of the shaddock generally receives this name. But on the Continent of Europe a different fruit, regarded by some as a variety of the orange, and by some as a distinct species (*Citrus decumana*), is known as the forbidden fruit, or Adam's apple. The name forbidden fruit has also been given to the fruit of *Tabernamontana dichotoma*, a tree of Ceylon, of the order Apocynaceæ. The shape of the fruit, which is a follicle, con-

taining pulp, suggests the idea of a piece having been bitten off, and the legend runs that it was good before Eve ate of it, although it has been poisonous ever since. See *POMELO*; *SHADDOCK*; *CITRUS*.

FORBIGER, for'big-ër, ALBERT (1798-1878). A German philologist, born in Leipzig. He studied at the University of Leipzig, in 1824 was appointed an instructor in the Nikolaischule in that city, and in 1835 became its associate rector. His publications include an edition of *Vergil* (4th ed. 1872-75); *Handbuch der alten Geographie* (1842-43), a translation into German of Strabo (1856-62); and *Hellas und Rom* (1871-82), with A. Winckler.

FORBIN, for'bän', CLAUDE, Count de (1656-1733). A French mariner, born at Gardanne (Provence). After a wild boyhood he entered the navy and distinguished himself by reckless bravery in the campaigns of Messina (1675), the Antilles (1680), and Algeria (1682-83). He was sent to Siam as Ambassador in 1685, and so pleased the King of that country that he made him his grand admiral. In 1689 Forbin returned to France, and under Jean Bart fought against England, and was taken prisoner. From 1690 to 1707 Forbin was very active. He fought at The Hague and Lagos, and at the taking of Barcelona, and afterwards captured numerous English and Dutch vessels as commander of the French fleet (1707). A year later he was in command of an expedition to conduct the Pretender to Scotland, but failed, as the coast was too well guarded. After this Forbin retired from active life and lived at Marseilles, where he wrote his entertaining *Mémoires*, which were edited by Reboulet, and first published in 1729.

FORBONNAIS, for'bô-nâ', FRANÇOIS VÉRON DUVERGER DE (1722-1800). A French political economist, born at Le Mans (Sarthe). After study of business methods at Nantes, and travel in Italy and Spain, he was appointed inspector-general of the Mint in 1756, and in 1759 the head of the office of Silhouette, Comptroller-General of the Finances. His advice was frequently sought by the Constituent Assembly of 1790, in connection with the reform of the monetary system. He was elected a member of the Institute of France in 1794. He wrote extensively on economic questions. He was possessed of judgment of a high order and clear style, and his works not only influenced the administration of his day, but are still regarded as valuable. These include *Eléments du commerce* (2 vols., 1754); *Recherches et considérations sur les finances de France depuis 1595 jusqu'en 1721* (1758); and *Principes et observations économiques* (1767). Consult *Delisle de Sales, Vie littéraire de Forbonnais* (Paris, 1801).

FORCE (Fr. *force*, OSp., It. *forza*, from ML. *fortia*, *force*, from Lat. *fortis*, strong; connected with Skt. *brhan*, high). If the motion of a body is observed to be changing, that is, if it is observed to have an acceleration (q.v.), it is said to be under the 'action of a force.' As illustrations, changes in motion are observed if a heavy body is allowed to drop from the hand, if a piece of iron is brought near a magnet, if a piece of paper or dust is brought near an electrified body, etc.; and, therefore, one speaks of the 'force of gravitation,' 'magnetic force,' 'electric force,' etc. In every case, however, when there is a change in

the motion of a body, it may be shown that this change is in some way due to the presence of some other body, e.g. the earth, the magnet, the charged body; and it is shown in mechanics (q.v.) that the proper measure of this influence on the body which receives the acceleration is the product of the numerical value of its mass, and the numerical value of the acceleration received. Thus, if a body whose mass is m grams is moving with an acceleration a (measured in centimeters and seconds), an 'external force' of ma dynes is said to be 'acting on it,' since in the C. G. S. system the dyne is the unit of force. This acceleration may, of course, be due to the simultaneous 'action' of several forces, each of which by itself would have produced a different acceleration. In particular, if there is no acceleration, this does not necessarily mean an absence of external action; but may mean that there are two forces acting in opposite directions which are numerically equal. There are two general methods for measuring forces. One is to measure the mass and the acceleration; the other is to balance the force by one whose value is known. Thus, as all bodies fall toward the earth at any one place on the earth with the same acceleration when allowed to fall *freely*, viz. with an acceleration which may be called ' g ' and which nearly equals 980, the force of the earth on a body, whose mass is m grams, i.e. its 'weight' is mg . Consequently, if this body is kept from falling by being suspended by a cord, the cord must exert on the body an *upward* force whose numerical value is mg . If, therefore, it is required to apply a force F in a particular direction, it is simply necessary to attach a body whose mass m equals F/g to one end of a cord, pass the cord over a pulley (q.v.), and attach its other end to the body on which the force F is to act, in such a manner that the cord pulls in the specified direction. Similarly, if any force can be neutralized by the weight of a body of mass m this force must have the numerical value mg dynes. In this way 'magnetic' or 'electric' forces can be measured.

The 'field of force' of a body is the region through which it is possible to detect the action of forces on other bodies due to its presence. Thus, the field of force of gravitation of the earth extends far beyond the moon out into celestial space; the field of magnetic force of the earth also extends far out into space—how far, it is not known; the field of electric force due to a charged body is in general a limited region quite near it. The 'direction of the field' at any point is that in which a specified particle of matter placed at that point would move under the action of the given kind of force, if allowed to move freely. Thus, the direction of the field of gravitational force around the earth is always vertically toward the centre of the earth; the direction of a magnetic field of force is that in which the north pole of a minute magnet would move; the direction of an electric field of force is that in which a particle of matter positively charged would move. The subject of force plays an important part in all conditions involving physical measurements, and for a further discussion of the matter the student of physics is referred to one of the modern treatises on physics. Consult: Everett, *Centimetre - Gramme - Second System* (London, 1875; and Daniell, *Text-Book of the Principles of Physics* (New York, 1894).

FORCE, MANNING FERGUSON (1824-99). An American soldier, writer, and lawyer, the son of Peter Force (q.v.). He was born in Washington, D. C., and graduated at Harvard College in 1845, and at the Harvard Law School. On the outbreak of the Civil War he entered the Federal Army as major of the Twentieth Ohio Volunteers; at the close of the war was brevetted major-general of volunteers. Refusing a colonelcy in the Regular Army, he resigned from the service, and subsequently was Judge of the Court of Common Pleas of Hamilton County, Ohio (1867-77); Judge of the Superior Court of Cincinnati (1877-87), and commandant for many years of the Ohio Soldiers' Home. He published: *From Fort Henry to Corinth* (1881); *Marching Across Carolina* (1883); *Personal Recollections of the Vicksburg Campaign* (1885); *Life of Justice John McLean*, and *Some Early Notices of the Indians of Ohio*; and *To What Race Did the Moundbuilders Belong?* (1879). He also edited Walker's *Introduction to American Law* (1878), and Harris's *Principles of Criminal Law* (1880). He began the preparation of the biography of General Sherman (1899), in the "Great Commanders Series," but failing health forced him to give up the task.

FORCE, PETER (1790-1868). An American scholar and historian, born at Passaic Falls, N. J. He learned and worked at the printer's trade in New York City, removed to Washington in 1815, and in 1820-36 published the *National Calendar*, a statistical annual. From 1823 to 1830 he was proprietor and editor of the *National Journal*, the official newspaper of the John Quincy Adams Administration. He was Mayor of the city of Washington in 1836-40, and in the latter year was elected the first president of the National Institute for the Promotion of Science. In 1836-46 he published a valuable series of *Tracts and Other Papers Relating to the Origin, Settlement, and Progress of the Colonies in North America, from the Discovery of the Country to the Year 1776* (4 vols.). But he is best known for his *American Archives*, a documentary history of the English colonies in North America, published at the expense of the Government under an act of Congress of 1833. Nine volumes, covering the period from 1765 to 1776, appeared in 1847-53, but the work was then discontinued owing to the refusal of Marcy, Secretary of State, to approve further volumes. Force's unique library, including 30,000 pamphlets and more than 20,000 volumes, and consisting principally of Americana, of which he was the earliest important collector, was purchased by the Government in 1867 for \$100,000, and incorporated with the Library of Congress. Force was also regarded as an authority on the literature of Arctic discovery. His further publications were *Grinnell Land* (1852), and *Record of Auroral Phenomena Observed in Higher Northern Latitudes* (1856).

FORCE BILL. In American political history, the name applied to several bills passed by the United States Congress. See NULLIFICATION; RECONSTRUCTION; KU-KLUX KLAN.

FORCE DE CHEVAL, *fôrs de she-vâl'* (Fr., horse-power). A French unit of power equal to 736 watts (q.v.), and corresponding to the English 'horse-power,' which is equivalent to 746 watts. It is the rate of work or activity equiva-

lent to 75 kilogrammeters per second. See MECHANICAL UNITS.

FORCED MARRIAGE, THE. (1) A tragedy-comedy by Mrs. Aphra Behn, produced at the Duke's Theatre in 1671. Its first performance is remarkable from the appearance of Otway in the rôle of the King. His ill success in the part made this his only appearance on the stage. (2) A tragedy by John Armstrong, written in 1754, but not published until 1770.

FORCELLINI, fôr'chêl-lê'nê, EGIDIO (1688-1768). An Italian philologist. He was born on August 26, 1688, in a village near Padua. Owing to the limited means of his family, Forcellini was deprived of early instruction, and was already verging toward manhood when enabled to commence a regular course of study in the seminary at Padua. His industry, combined with his powers of learning, won the admiration of the principal, Giacomo Facciolati, who associated him with some of his own scientific labors. The pupil rendered his teacher valuable service in the compilation of a highly important lexicon, a work which probably inspired both with the project on which Forcellini's literary repute is based—the compilation of a comprehensive vocabulary of the Latin language. The work was published after Forcellini's death, and was one of the most valuable acquisitions to philological science of the age. In addition to the Italian and Greek signification of the Latin word, the literal and figurative application of each expression is given in a collection of examples, embracing the customs, laws, arts, sciences, religion, and history of the Romans. So full are the citations that it has been said that, if the whole body of extant Latin literature were destroyed, it could be in great part recovered from the quotations given in this lexicon. The work was published in four volumes, folio, under the title *Totius Latinitatis Lexicon, Consilio et Cura Jac. Facciolati, Opera et Studio Eg. Forcellini Lucubratum* (1771). The last edition, with an Onomasticon, was published by De Vit (Prato, 1858-60). Forcellini died in Padua, April 4, 1768.

FORCEPS (Lat., pincers). The name given by surgeons to an instrument of great antiquity, used as a substitute for the fingers, and consisting of two levers of metal jointed together crosswise, usually nearer to one end than the other. The hand grasping the longer ends of the levers or handles, closes the shorter ends, which are shaped so as to seize firmly the intended object. There is scarcely a surgical operation in which it is not applied. The variety is almost innumerable. In addition to the forms used in dentistry, there are in common use the *dissecting* forceps, which has roughened points, to lay hold of small portions of tissue which are to be divided by the knife; the *lithotomy* forceps, which has blades concave like spoons, while other forms of this forceps are adapted for seizing stones of various shapes and sizes; and *artery* forceps, with locks for seizing and holding the extremities of bleeding vessels. By means of Liston's *cutting* forceps, a powerful hand can divide a great thickness of bone. One of the most important of all forceps is the *obstetric* forceps, an invaluable invention in cases of difficult delivery. It consists of two concave fenestrated blades, forming a cavity into which the head of the child fits. The blades are applied

separately, one to each side of the head, and then locked together. Holding by the handles, the accoucheur aids the natural efforts of labor. The instrument does not necessarily or generally injure either mother or child.

FORCHHAMMER, fôr'châm-mêr, JOHANN GEORG (1794-1865). A Danish geologist. He was born in Husum, Schleswig, studied at Kiel and Copenhagen, and was associated with Oersted and Esmarch in a mineralogical exploration of Bornholm. In 1831 he became professor of mineralogy in the university and curator of the geological museum at Copenhagen. He succeeded Oersted in 1851 as director of the Polytechnic School and secretary of the Academy of Sciences. His researches (jointly with Steenstrup and Worsaae) on the prehistoric anthropology of the north of Europe, have yielded results of great importance. Among his publications are: *Krystallographie* (1833); *Danmarks geognostiske Forhold* (1835); and *Bidrag til Skildringen af Danmarks geografiske Forhold* (1837).

FORCHHAMMER, PETER WILHELM (1801-94). A German classical archaeologist and mythologist, brother of Johann Georg Forchhammer. He was born at Husum, Schleswig, and studied at the University of Kiel, where he became professor extraordinary in 1836. In 1830 he visited Italy and Greece, and in 1838 undertook a second journey to Greece, Asia Minor, Egypt, and Rome, which bore fruit in valuable contributions to the topography of ancient Hellas and the Greek settlement in Asia. Among these works were *Hellenika* (1837) and *Ueber die Reinheit der Baukunst* (1856), in which he traced the four styles of Greek architecture to climatic conditions and differences in materials. He also wrote treatises on the philosophy of Aristotle and on the archaeology and mythology of Greece. In his works on the latter subject he invariably regarded the Hellenic myths as personified embodiments of natural, and especially aquatic, phenomena. Among these publications mention should be made of his *Achill* (1853); *Daduchos* (1875); *Die Wanderungen der Inachostochter Io* (1881); *Erklärung der Ilias auf Grund der topischen und physischen Eigentümlichkeiten der troischen Ebene* (1884); *Prolegomena zur Mythologie als Wissenschaft und Lexikon der Mythensprache* (1891); and *Homer: Seine Sprache, die Kampfplätze seiner Heroen und Götter in der Troas* (1893). His early work, *Die Athener und Sokrates* (1837), contained many original ideas that were at first ridiculed, but afterwards were accepted by prominent historians. Forchhammer sat in the Prussian Diet from 1868 to 1870, and from 1871 to 1873 was a member of the German Reichstag.

FORCHHEIM, fôr'ch'hm. A town in Upper Franconia, Bavaria, near the junction of the Wiesent with the Regnitz, on the Ludwigskanal, 16 miles south-southeast of Bamberg (Map: Germany, D 4). It has a castle and a Gothic church. Its manufactured products include machinery, cloth, and paper. Forchheim was an important town in the days of Charlemagne, and in the ninth and tenth centuries was the meeting-place of many royal diets. From 1007 to 1802 it was held by the bishops of Bamberg, except during an interval of about thirty years. In its vicinity the French, on August 7, 1796, gained a

victory over the Austrians. Population, in 1900, 7590.

FORCIBLE ENTRY AND DETAINER. The taking or keeping possession of real property through threats or force, with no authority of law. To make such forcible entry there must be such acts of violence, menaces, or gestures as may give reason to anticipate personal injury or danger in making a defense. But the force must be more than is implied in mere trespass. There are in most of the States statutes regulating proceedings in cases of forcible entry, directing the manner of proceeding for the restoration of property unlawfully withheld and the punishment of the offender. The plea of ownership is not a justification of the defendant, for no one may enter even upon his own property in any other than a peaceable manner. Nor can he be excused on the plea that he entered to enforce a lawful claim or make a distress, nor on the plea that possession was finally obtained by entreaty. The policy of this legislation is to prevent the disturbance of the public peace, and to compel disputants to settle their controversy in a court of justice.

Originally by the common law of England the right of entry upon land of which one had been unlawfully deprived might be exercised by force or threats, if necessary. But by a series of early statutes, the first of which dates back to the time of Richard II., this remedy was limited to an entry "in a peaceable and easy manner, and not with force or strong hand." See **ENTRY**, **RIGHT OF**.

FORCING (in horticulture). The acceleration of vegetation by application of artificial heat. The term is not usually applied to the cultivation of exotic plants in hothouses, where the object is to imitate as much as possible their native climate; but it is strictly applicable to the system usually pursued with grapes, pine-apples, tomatoes, and other plants, to secure the production of fruit at desired seasons, and by different plants of the same kind in succession through a considerable period; the heat being increased for one set of plants sooner than for another. Many of the fruits and vegetables which grow well in the open air are very commonly forced, in order that they may be procured out of their natural season. Thus, rhubarb is forced by means of the heat produced by heaps of fermenting manure. Asparagus, salads, radishes, lettuce, onions, etc., are often forced by means of hotbeds, or in flued pits, or a place is found for them in hothouses. Strawberries are treated in the same way. See **HOTBED**; **HOTHOUSE**.

FORCKENBECK, fôr'k'en-bêk, MAX VON (1821-92). A German Liberal politician, born at Münster, Westphalia. In 1858 he was elected a member of the Prussian House of Representatives; in 1862 became a founder of the organization styled the 'Fortschrittspartei,' or 'Party of Progress,' and in 1866 of the National Liberal Party. He was elected president of the House in 1866. From 1867 until his death, except for the period from 1887 to 1890, he was a member of the Reichstag, and from 1874 to 1879 its president. He sat in the Prussian House of Peers from 1873, as chief burgomaster of Breslau, and from 1878 until his death he was chief burgomaster of Berlin. He displayed considerable ability as a party leader and presiding officer.

FORD, EDWARD ONSLOW (1852-1901). An English sculptor, born in London. He studied in 1870 at the Antwerp Royal Academy, in 1871-72 at the Munich Royal Academy, became an associate of the Royal Academy in 1888, and a Royal Academician in 1895. He was also elected a corresponding member of the Institute of France. His more important works include statues of Sir Rowland Hill (1882), at the Royal Exchange, selected in open competition by the committee of the Corporation of London; of Gladstone (1883), at the City Liberal Club, London; of Sir Henry Irving as Hamlet (1885); and of C. G. Gordon ('Chinese' Gordon) (1890), at Chatham. Others are the Marlowe Memorial at Canterbury; the Shelley Memorial at University College, Oxford; and a statue of Huxley (1900), at the British Museum of Natural History.

FORD, EMANUEL. An Elizabethan romancer. He was the author of *Parismus*, in two parts (1598-99), long exceedingly popular, and of the similar romances, *Ornatus and Artesia* (1607) and *Montelion* (1633, but probably published earlier).

FORD, Sir FRANCIS CLARE (1828-99). An English diplomat. He was commissioned a lieutenant in the Fourth Light Dragoons, but left the army in 1851, entered the diplomatic service, and became secretary of legation at Washington, where he was acting chargé d'affaires in 1867-68. In 1871 he was appointed secretary of embassy at Saint Petersburg, and in 1872 was transferred to Vienna. He represented the British Government in 1897 at Halifax before the International Commission, by decision of which a sum of \$5,500,000 was awarded to Great Britain as compensation for superior advantages obtained by the United States in the Washington fisheries treaty of 1871. From 1878 to 1879 he was Envoy Extraordinary and Minister Plenipotentiary to the Argentine Republic, and during a portion of the time to Uruguay also. He was afterwards appointed to similar posts at Rio de Janeiro and at Athens; in 1884 became Minister (from 1887 Ambassador) to Spain; in 1892 was transferred to Constantinople, and in 1893 to Rome. His services to British diplomacy won for him frequent official recognition, including appointment to the Privy Council in 1888.

FORD, JOHN (1586-?). An English dramatist, son of Thomas Ford, of Ilstington, Devonshire. After studying for about a year at Exeter College, Oxford, he was admitted a member of the Middle Temple (November, 1602). His first publication was an elegy on the Earl of Devonshire, entitled *Fame's Memorial* (1606), to which was prefixed a dedicatory sonnet to Lady Penelope, Countess of Devonshire, the Stella of Sidney's verse. This was followed the same year by *Honor Triumphant*. His dramatic career began in 1613, when his play *An Ill Beginning Has a Good End* was produced at the Cockpit. Thereafter he wrote many plays (e.g. *The Bristow Merchant*, tragedy, 1624), single-handed or in collaboration with Dekker, Rowley, and Webster. His two most powerful tragedies are *'Tis Pity She's a Whore* (1633) and *The Broken Heart* (1633). After 1639 nothing more is heard of him. Ford belongs to a group of Jacobean dramatists who wrote for an audience demanding sensation, complicated plots, and strong motives.

Pathos he exaggerated for dramatic effect. Nevertheless, his tragedies contain some of the greatest scenes after Shakespeare. In comedy he was weak. His *Dramatic Works*, with those of Massinger, were edited by Hartley Coleridge (new ed. London, 1883), and an edition of *Plays, selected*, by Ellis, appeared in the "Mermaid Series" (London, 1888).

FORD, JOHN THOMSON (1829-94). An American theatrical manager, born at Baltimore. He became manager of the Holliday Street Theatre in Baltimore, where he was elected president of the Municipal Council (1858), and was Acting Mayor for two years. At Washington, D. C., he built three theatres, one of which was that known as Ford's Theatre, the scene of the assassination of President Lincoln by Booth on April 14, 1865. On suspicion of complicity in connection with the deed, he was arrested and imprisoned for forty days. He was then released, inasmuch as absolutely no evidence was adduced against him. In 1871 he built Ford's Grand Opera House at Baltimore. He was long one of the board of governors of the Maryland Penitentiary, and at one time president of the board of directors of the Baltimore and Ohio Railway.

FORD, MASTER. In Shakespeare's *Merry Wives of Windsor*, a jealous husband, to whom, under the name of Master Brook, Falstaff relates the course of his attempted wooing of Mrs. Ford.

FORD, PAUL LEICESTER (1865-1902). An American historian and novelist, born in Brooklyn, N. Y. He was privately educated, and after wide travels in both hemispheres he devoted himself to investigations in the sources of American history, and edited the *Writings of Thomas Jefferson*, in ten volumes (1892); the *Writings of Thomas Dickinson* (2 vols.); *The Federalist* (1886), etc. These studies led to *The True George Washington* (1896); *The Many-Sided Franklin* (1899); and *The New England Primer*, with many minor writings of like character. To fiction he contributed: *The Honorable Peter Sterling* (1894); *The Great K. & A. Train Robbery* (1897); *The Story of an Untold Love* (1897); *Tattle Tales of Cupid* (1898); a collection of short stories; *Janice Meredith* (1899); *Wanted: A Matchmaker* (1901); and *Wanted: A Chaperon* (1902). Mr. Ford also did valuable work in the *Bibliographer*, which he founded, and of which he was editor at the time of his death.

FORD, RICHARD (1796-1858). An English writer. He graduated at Trinity College, Oxford, in 1817, and was afterwards called to the bar, but never practiced. He spent four years traveling in Spain, and in 1845 published his delightful *Handbook for Travelers in Spain*. A second edition was smaller in bulk, and the material left out was published in *Gatherings from Spain* (1846). Ford also contributed important papers on Spanish art to the *Quarterly Review* and other periodicals. In 1837 he published a pamphlet entitled *Historical Inquiry into the Unchangeable Character of a War with Spain*.

FORD, WORTHINGTON CHAUNCEY (1858—). An American author and statistician, born and educated in Brooklyn, N. Y. After several years spent in the publishing and newspaper business, he was appointed, in 1885, chief of the Bureau of Statistics of the Department of State in Wash-

ington, continuing in that position until 1891. From 1893 to 1898 he was chief statistician of the Treasury Department, and in the latter year became connected with the Boston Public Library. In 1902 he was also appointed expert accountant to the municipal government of New York City. He wrote *The American Citizen's Manual* (1883); *The Standard Silver Dollar* (1884); *George Washington* (1901), and numerous monographs and pamphlets on historical, biographical, and economic subjects. He revised David A. Wells's *Natural Philosophy* (1879), and edited the *Correspondence and Journals of Samuel Blachley Webb* (1893-94) and *The Writings of George Washington* (1889-91), his most important work.

FORDHAM. Formerly a village in Westchester County, N. Y., but since 1874 a part of New York City, being now included in the Borough of the Bronx. Saint John's College, a Jesuit institution, is situated here (Map: Greater New York, D 2). Originally, along with Yonkers, in the possession of Adrian Vander Donck, Fordham was erected into a manor in 1671, and became a separate parish in 1850.

FORDIL'LA (Neo-Lat., named in honor of the discoverer, S. W. Ford). A small bivalve shell found in the limestones of Lower Cambrian age of Rensselaer and Columbia counties, New York, and supposed to be the oldest known pelecypod or clam-shell. See CAMBRIAN SYSTEM; PELECYPODA.

FORD'S THEATRE. A Washington theatre, in which President Lincoln was assassinated by Booth, April 14, 1865. The building was purchased in 1866 by the United States Government, and was used until 1887 as the Army Medical Museum, and later as the Pension and Records Bureau of the War Department. It collapsed, with the loss of many lives, on June 9, 1893.

FORDUN', JOHN OF (?-c.1384). A Scottish historical writer. He was probably a chantry priest in the Cathedral of Aberdeen. He is said to have traveled on foot through Britain and Ireland in search of materials for a chronicle of Scotland, which he had set himself to compile. This was probably between 1363 and 1384. He died probably in 1384, or a little later. Of his *Chronica Gentis Scotorum* he wrote five books, extending to 1353, and a part of Book VI., which deals with English history. His *Gesta Annalia* extend from 1353 to 1383. The work which John of Fordun left unfinished was continued by Walter Bower (q.v.). Fordun's chronicle is the chief authority for the history of Scotland prior to the fifteenth century, its value being greatest for the fourteenth, where it is contemporary. Four printed editions have been published, of which the best is that by Skene (Edinburgh, 1871-72), from the text of the Wolfenbüttel and other standard manuscripts. Bower's interpolations and additions are separated from Fordun's text.

FORECAST, WEATHER. See METEOROLOGY; WEATHER BUREAU.

FORECLOSURE. The legal process whereby a mortgagor's right, or 'equity,' of redemption is cut off and the mortgagee's lien on the mortgaged lands or goods enforced. In order to put a limit on the 'equity of redemption' of the mortgagor (see EQUITY OF REDEMPTION) the remedy of foreclosure was devised by the Court of Chancery. It is available to the mortgagee at any

time after default, and is instituted by a bill of foreclosure praying that an account may be taken of the principal and interest due under the mortgage, and that the mortgagor, on failing to pay by a specified date, may forfeit his equity of redemption. If on the day fixed for payment the money be not forthcoming, the mortgagor will be declared to have forfeited his equity of redemption, and the mortgagee will be allowed to retain the estate in perpetuity. This method of enforcing the security of the mortgagee of lands is still in use in England and in many of the United States.

In a few of the American States, however, in which the mortgage has come to be regarded as a mere lien, and not as a legal estate in the mortgagee, a statutory process, known also as a foreclosure, has been adopted in lieu of the foregoing process of 'strict' foreclosure. This differs from the older method principally in the fact that it involves the satisfaction of the debt, not by a forfeiture, but by a sale of the mortgaged premises. The suit, which is also in equity, is instituted by the mortgagee as plaintiff, the mortgagor and all creditors, subsequent lienors, and other parties in interest, being made defendants. The demand is for a judgment that the defendants be foreclosed and cut off from all their interest in the mortgaged premises, and that the same be sold to satisfy the mortgage debt. The sale is made upon notice, and is at public auction, generally by the sheriff or a referee appointed by the court. After the sale the money in the hands of the referee will be applied to the payment of the mortgage, and any surplus may be claimed by subsequent mortgagees; or, if there is no other claim upon it, it will be paid to the mortgagor. Other methods of effecting a foreclosure, by legal rather than equitable process, as by a writ of entry or of ejectment directed by the mortgagee against the mortgagor, also occur in a few States. See **EQUITY OF REDEMPTION; MORTGAGE;** and the authorities there referred to.

FOREIGN ATTACHMENT. A process which a few local courts of England have authority, by immemorial custom, to issue. The custom of the Mayor's Court of London is that when a foreigner defendant, of whom the court has jurisdiction, does not appear in response to a summons served on him, the plaintiff may attach his goods or debts due to him as security to enforce his appearance. Recent decisions of the House of Lords have so narrowed the custom and have pointed out so many difficulties of procedure under it that it has fallen into disuse. In this country the attachment or garnishment of the goods or debts of non-residents is regulated by statutes in the several States. See **ATTACHMENT; GARNISHMENT;** and the authorities there referred to.

FOREIGN JUDGMENT. The judgment of a tribunal in a jurisdiction independent of that in which it is sought to be enforced. The effect to be given to such a judgment depends either upon treaty or the comity of nations. A government is not bound to enforce a judgment rendered in another country, nor even to recognize its existence, unless it has agreed to do so. As a matter of courtesy, however, toward sister States, as well as from considerations of convenience to suitors, each civilized nation is ac-

customed to treat a foreign judgment as conclusive upon the parties thereto concerning the matters decided by it, unless it is shown that the judgment was obtained by fraud, or that the court granting it did not have jurisdiction.

The States of the United States are foreign to each other so far as their judicial systems are concerned. They are subject, however, to the Federal Constitution, which declares that "full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State. And the Congress may by general laws prescribe the manner in which such acts, records, and proceedings shall be proved, and the effect thereof." (Art. IV., Sec. 1.) This does not mean that a judgment obtained in one State can be enforced by an *execution* issued in another State. It only means that if an action is brought upon such judgment in another State, or if the judgment is pleaded there in bar to an action brought for the same cause, it shall receive the same credit that it would receive in similar circumstances in the State where it was rendered.

By common law a foreign judgment is proved by an exemplified copy under the great seal of the State, or by a true copy proved to be such by a witness who compared it with the original, or by the proper certificate of an officer duly authorized by law. Special methods of proving such judgments are provided by statute in the various States. (See **DIVORCE; JUDGMENT.**) Consult Freeman, *Treatise on the Law of Judgments* (4th ed., San Francisco, 1892).

FOREIGN LAW. The law of a foreign country. The law of a State is, under modern conditions, entirely without authority in any other country, though foreign States may, as a matter of international comity, recognize the validity of acts legally performed in other countries, and may even, under proper conditions, administer the rules and principles of foreign law in its own tribunals. As to the circumstances under which this will be done, see **CONFLICT OF LAWS.**

For judicial purposes the several States of the Union are foreign to each other, though the comity subsisting between them is of the strongest character and has led to an extraordinary development of the principle of the recognition of the validity of judicial acts of one State in another. See **FOREIGN JUDGMENT; EXTRADITION.**

The courts of a country do not take judicial notice of foreign laws, but, where they are in issue, require them to be proved as matters of fact. Foreign statutory law may be proved by duly certified copies of the statutes in question, or even by printed compilations issued by the authority of the State enacting them. Foreign customary, or unwritten, law, however, can be proved only by the sworn testimony of properly qualified experts, though it has been held in the United States that the law of a kindred system like that of England may be established for judicial purposes by the citation of reported cases and text-books of recognized authority. In general, the courts of the several United States will take judicial notice of the laws of sister States, though in some of the States proof of the law of other States is required by the citation of reported cases, and the like. The Federal courts of the United States, however, even in matters in which

they have no jurisdiction, will always take judicial notice of the laws of all the States. See COMITY OF NATIONS and INTERNATIONAL LAW.

FOREIGN MONEY, VALUE OF. For the purpose of fixing the rates at which the different for-

eign coins shall be computed for the purpose of determining the values of goods imported into the United States, it is made the duty of the Director of the Mint to publish from time to time the values of foreign coins. This was formerly

VALUE OF FOREIGN COINS*

COUNTRY	Standard	Monetary unit	Value in terms of U. S. gold dollar	Coins
Argentine Republic.....	Gold.....	Peso.....	\$0.965	Gold: argentine (\$4.824) and ½ argentine. Silver: peso and divisions.
Austria-Hungary	Gold.....	Crown.....	.203	{ Gold: former system—4 florins (\$1.929), 8 florins (\$3.858), ducat (\$2.287) and 4 ducats (\$9.149). Silver: 1 and 2 florins. Gold: present system—20 crowns (\$4.052); 10 crowns (\$2.026).
Belgium.....	Gold.....	Franc.....	.193	Gold: 10 and 20 francs. Silver: 5 francs.
Bolivia.....	Silver.....	Boliviano.....	.384	Silver: boliviano and divisions.
Brazil.....	Gold.....	Milreis.....	.546	Gold: 5, 10, and 20 milreis. Silver: ½, 1, and 2 milreis.
British Possessions, N. A. (except Newfnd)....	Gold.....	Dollar.....	1.000	
Central Amer. States—Costa Rica.....	Gold.....	Colon.....	.465	Gold: 2, 5, 10, and 20 colons (\$9.307). Silver: 5, 10, 25, and 50 centimos.
British Honduras.....	Gold.....	Dollar.....	1.000	
Guatemala.....	Silver.....	Peso.....	.384	Silver: peso and divisions.
Honduras.....				
Nicaragua.....				
Salvador.....				
Chile.....	Gold.....	Peso.....	.365	Gold: escudo (\$1.825), doubloon (\$3.650), and condor (\$7.300). Silver: peso and divisions.
China.....	Silver....	Tael {	Amoy.....	
			Canton.....	
			Chi-fu.....	
			Chin-kiang.....	
			Fu-chow.....	
			Hai-kwan.....	
			(Customs)	
			Hankow.....	
			Hong Kong.....	
			Niu-chwang.....	
Colombia.....	Silver....	Peso.....	Ning-po.....	Gold: condor (\$9.647) and double-condor. Silver: peso. Gold: Doubloon Isabella, centen (\$5.017). Alphonse (\$4.823). Silver: peso.
			Shanghai.....	
			Swatow.....	
			Tien-tsin.....	
Cuba.....	Gold.....	Peso.....	.926	Gold: 10 and 20 crowns.
Denmark.....	Gold.....	Crown.....	.268	Gold: 10 sucres (\$4.8665). Silver: sucre and divisions.
Ecuador.....	Gold.....	Sucre.....	.487	Gold: pound (100 piasters), 5, 10, 20, and 50 piasters.
Egypt.....	Gold.....	Pound (100 piasters).....	4.943	Silver: 1, 2, 5, 10, and 20 piasters.
Finland.....	Gold.....	Mark.....	.193	Gold: 20 marks (\$3.859), 10 marks (\$1.93).
France.....	Gold.....	Franc.....	.193	Gold: 5, 10, 20, 50, and 100 francs. Silver: 5 francs.
German Empire.....	Gold.....	Mark.....	.238	Gold: 5, 10, and 20 marks.
Great Britain.....	Gold.....	Pound sterling.....	4.866½	Gold: sovereign (pound sterling) and ½ sovereign.
Greece.....	Gold.....	Drachma.....	.193	Gold: 5, 10, 20, 50, and 100 drachmas. Silver: 5 drachmas.
Haiti.....	Gold.....	Gourde.....	.965	Gold: 1, 2, 5, and 10 gourdes. Silver: gourde and divisions.
India.....	Gold.....	Pound sterling.....	4.866½	Gold: sovereign (pound sterling). Silver: rupee and divisions.
Italy.....	Gold.....	Lira.....	.193	Gold: 5, 10, 20, 50, and 100 lire. Silver: 5 lire.
Japan.....	Gold.....	Yen.....	.498	Gold: 5, 10, and 20 yen. Silver: 10, 20, and 50 sen.
Liberia.....	Gold.....	Dollar.....	1.000	
Mexico.....	Silver....	Dollar.....	.417	Gold: dollar (\$0.983), 2½, 5, 10, and 20 dollars. Silver: dollar (or peso) and divisions.
Netherlands.....	Gold.....	Florin.....	.402	Gold: 10 florins. Silver: ½, 1, and 2½ florins.
Newfoundland.....	Gold.....	Dollar.....	1.014	Gold: 2 dollars (\$2.027).
Norway.....	Gold.....	Crown.....	.268	Gold: 10 and 20 crowns.
Persia.....	Silver....	Kran.....	.071	Gold: ½, 1, and 2 toman (\$3.409). Silver: ¼, ½, 1, 2, and 5 krans.
Peru.....	Gold.....	Sol.....	.487	Gold: libra (\$4.8665). Silver: sol and divisions.
Portugal.....	Gold.....	Milreis.....	1.080	Gold: 1, 2, 5, and 10 milreis.
Russia.....	Gold.....	Ruble.....	.515	Gold: imperial, 15 rubles (\$7.718), and ½ imperial, 7½ rubles (\$3.859). Silver: ¼, ½, and 1 ruble.
Spain.....	Gold.....	Peseta.....	.193	Gold: 25 pesetas. Silver: 5 pesetas.
Sweden.....	Gold.....	Crown.....	.268	Gold: 10 and 20 crowns.
Switzerland.....	Gold.....	Franc.....	.193	Gold: 5, 10, 20, 50, and 100 francs. Silver: 5 francs.
Turkey.....	Gold.....	Plaster.....	.044	Gold: 25, 50, 100, 250, and 500 piasters.
Uruguay.....	Gold.....	Peso.....	1.034	Gold: peso. Silver: peso and divisions.
Venezuela.....	Gold.....	Bolivar.....	.193	Gold: 5, 10, 20, 50, and 100 bolivars. Silver: 5 bolivars.

* The coins of silver-standard countries are valued by their pure silver contents, at the average market price of silver for the three months preceding the date of this circular.

† The 'British dollar' has the same legal value as the Mexican dollar in Hong Kong, the Straits Settlements, and Labuan.

‡ The sovereign is the standard coin of India, but the rupee (\$0.3244½) is the money of account, current at 15 to the sovereign.

done annually, but the fluctuating value of silver coins led in 1890 to a change in the law, requiring the statement to be made quarterly. Gold coins are reckoned by comparing the number of grains of fine gold which they contain with the amount of gold in the dollar. Silver coins are reckoned at the average value of the pure metal they contain during the three months prior to the determination of their value. When the values are determined by the Director of the Mint and proclaimed by the Secretary of the Treasury, they are valid in estimating the value of imports for the succeeding three months. The statement for October 1, 1902, is shown on the preceding page.

FOREIGN TRADE. See IMPORTS AND EXPORTS; FREE TRADE; TARIFF; BALANCE OF TRADE.

FOREIGN WARS, MILITARY ORDER OF. An hereditary patriotic society instituted in New York City in 1894, as the Military and Naval Order of the United States, but known under its present name since 1895. The objects of the order are to honor and preserve the names and memory of those who aided in maintaining the United States Government in the five foreign wars in which it has been engaged—namely, the War of the Revolution, the War with Tripoli, the War of 1812, the Mexican War, and the War with Spain—and to collect the records and documents relating to these wars. It admits to membership Veteran Companions, consisting of commissioned officers of the army, navy, and marine corps of the United States who participated in any of these foreign wars, and also Hereditary Companions, direct lineal descendants of commissioned officers in the main line. The national organization is made up of twenty-two State commanderies. The Order has a membership of over 1600 companions, among whom are many of the leading officers of the army and navy. This Order has been officially recognized by several European monarchs.

FOREKNOWLEDGE AND FOREORDINATION. Terms of theology, signifying God's knowledge of all things before they come to pass (foreknowledge); and the eternal purpose which finds its execution in time in the government of the history of man (foreordination). By some the divine foreknowledge and the divine foreordination are thought to have no dependence upon each other, pertaining to different spheres of the divine attributes and activity; by others foreordination, as respects the acts of free creatures, is thought to depend upon the foreknowledge of what those acts will be; or, again, foreknowledge to depend upon foreordination.

There are various theories of foreknowledge. (a) It is viewed simply as one of the divine perfections, absolute because the nature of God is infinite, and thus embracing all events whatsoever, including the volitions of free beings, but capable of no explanation except that it is a fact of the nature of God. Foreknowledge is no more of a mystery upon this view than any knowledge, or any other attribute of God. (b) A kindred view adds an element of explanation from the 'ideality of time.' There is no time to God, and hence foreknowledge, in the human sense of that word, does not exist. To know the future does not essentially differ from the knowledge of the present, for all the future is present to God. (c) Foreknowledge depends upon fore-

ordination. God has in some sense foreordained all things, and what He foreordains He knows, not with an immediate vision, as is supposed by the previous theories, but by the knowledge of inference and imagination. (d) The foreknowledge of God is limited by the freedom of man, inasmuch as he cannot foreknow contingent volitions which are essentially uncertain. This is a voluntary self-limitation, since God has Himself given His creatures freedom. It involves no derogation from the greatness or the dignity of God. And it is only one example of the numerous limitations which He put upon Himself in the creation, and particularly in the redemption of man. (See KENOSIS.) This theory has been proposed at various periods in history, but has always met with rejection as militating against the infinity of God. It is, however, finding increased favor at the present day in many quarters.

The proofs of God's foreknowledge are derived from the perfection of God and from the Scriptures. Even men have a certain kind and degree of foreknowledge, which is absolutely essential to them in the regulation of life. If God were nothing more than an infinite man, He must have at least the same sort of foreknowledge, and in an infinite degree. This proof is reinforced by the Scriptures, which ascribe the most various and minute foreknowledge to God. Yet neither of these proofs goes so far as they have often been supposed to go. The foreknowledge ascribed to God in the Scriptures is very vast, as it must be in the nature of the case. But the Bible is not a metaphysical book, and leaves the question still unanswered whether there may not be some events, one perhaps in a hundred thousand, which God does not foreknow. In fact, many of the representations of Scripture, though often interpreted as anthropomorphisms, are in favor of a certain lack of knowledge of the future. Nothing in Scripture answers the question whether free volitions are in themselves subject to foreknowledge. Many are; for, though free in their essential nature, they are made in conformity with the balance of motives, and may be foreknown. This fact is the foundation of society. But, while volitions remain free, are there none that are unaccountable, against the balance of motives, and hence uncertain? That is the question of free will (q.v.); and it would be false exegesis which would rest its determination upon passages of Scripture.

Foreordination pertains to all events. So much is maintained by all theologians. Some teach that all events are embraced in foreordination in the same sense and way. This theory differs from fatalism because intended to be consistent with the freedom and responsibility of the creature; and it may be consistent if determinism (see FREE WILL) is consistent, as was maintained by Edwards and many others. Commonly a distinction has been made between foreordination and permission. The first sin of man is then said to have been permitted, and the lost are said not to have been 'reprobated,' but 'passed over' by electing grace; that is, left in the sinful state into which they have voluntarily brought themselves. Others, with more direct reference to free will and with a conception of the divine government as a moral government—that is, one through persuasives acting upon the will—have

said that foreordination is the determination in the first instance as to what God will Himself do. From what He does, often follows immediately what men do, as in regeneration which leads to conversion, or when He does not do what would prevent sin. Thus He often indirectly foreordains what men shall do. This indirect foreordination will ultimately extend to the entire circumference of the government of God, and it will be in such a sense that it can be said that God foreordains 'whatsoever cometh to pass.' The divine government embraces all things even when it is in part a government of permission.

While the proofs of the divine foreordination are derived from the Scriptures, which are full of declarations as to what God will do, the proof is also rational. The proof of the existence of God involves in it the idea of plan (teleological argument), and plan is foreordination. Conceived as the plan of the world and of the history of man, foreordination may be interpreted by the actual course of events. Whatever may be said about speculative points, it is thus indubitable that God planned to create the world, to place man in it, to provide for his salvation when he had sinned, to lead Israel through all the crises of its history toward the moment when the Redeemer could be sent, to send the Redeemer, and to conduct the Church through those courses of revival and reformation when fallen into declension, by which its present degree of success has been attained. And as all this involves the existence of a chosen people, and this, again, the choice of individuals as its members, foreordination involves election (q.v.).

The grounds of this plan are to be found in the infinite wisdom and goodness of God. Whatever may be the success with which various schools have made this clear, such has been the meaning of all theologians. The most extreme schools of supralapsarians have believed that the lost were lost in consequence of their own sin, for which they were guilty, and which deserved in justice precisely the punishment they received; and they have also believed that justice must be done, and that neither wisdom nor goodness could permit it to go unsatisfied. The doctrine of election, which is but a corollary of foreordination, has often been regarded as a doctrine of favoritism. But theologians have never meant this by it. They have always founded it in the wisdom and goodness of God. They have often maintained that God elected every one who could be gained to righteousness by all the resources of His government. They have sometimes taught that more efforts were put forth for the finally lost than for some who were actually saved. The differences between the schools upon this doctrine have often been resolvable into this, that some referred a given fact to God, because it was under His government though by permission, while others ascribed it purely to man because done by him, though confessedly under a governmental permission.

The consistency of plan with free agency must be a real consistency under the divine government because it is real under human governments. A human governor can successfully determine to conquer a country under the conditions in which he is placed, and can successfully carry out his determination, as when Frederick

the Great conquered Silesia. God can do the same. The attempts of philosophy to explain this consistency do not affect its reality, whether more or less successful. Consult: Mozley, *Treatment on the Augustinian Doctrine of Predestination* (London, 1855); McCabe, *The Foreknowledge of God and Cognate Themes* (New York, 1878). See FREE WILL.

FOREL, fô'rel', AUGUSTE (1848—). A Swiss entomologist and psychologist. He was born at Morges (Canton of Vaud); studied at the universities of Zürich and Vienna, became a lecturer at Munich in 1876, and later held the chair of psychiatry at Zürich, from which he resigned in 1897. He was connected as assistant and director with various institutions for the insane. His publications include the prize essay *Les fourmis de la Suisse* (1874); *Der Hypnotismus* (1889; 4th ed. 1902); *Gehirn und Seele* (1894; 6th ed. 1899); and *Die psychischen Fähigkeiten der Ameisen und einiger anderen Insekten* (1901).

FOREL, FRANÇOIS ALPHONSE (1841—). A Swiss physician and naturalist, brother of the preceding, born at Morges (Canton of Vaud). After medical studies he was appointed professor of anatomy and physiology in the University of Lausanne. His studies concern the glaciers and lakes of Switzerland. His contributions to the natural history of the latter have appeared in *Le Léman* (1892-96), and in the *Handbuch der Seenkunde* (1901).

FORELAND, NORTH AND SOUTH. Two promontories on the east coast of Kent, England. NORTH FORELAND, the *Cantium* of Ptolemy, forms the northeast point of the county, and is in latitude 51° 22' N., two miles east of Margate (Map: England, H 5). Its chalk cliffs, nearly 200 feet high, projecting into the North Sea, are crowned by a lighthouse, with a fixed light, 184 feet high visible 24 miles.—SOUTH FORELAND, also composed of chalk cliffs, 16 miles south of North Foreland and 3 miles northeast of Dover, has two fixed lights, respectively 380 and 275 feet above the sea, and visible about 25 miles (Map: England, H 5). They indicate the proximity of the dangerous Goodwin Sands (q.v.), and the anchorage of the Downs (q.v.).

FORENSIC MEDICINE. See MEDICAL JURISPRUDENCE.

FORESHORTENING. That view of a figure or portion of a figure which, obeying the laws of perspective, diminishes in actual extent according to the angle at which it is seen. For example, a figure looked at from below becomes condensed, as it were, in length, and in portraying such an abrupt view there would be less space demanded than if the figure stood upright on the same level as the observer. In the same sense an arm extended and pointing directly out of the picture would require less actual space on the canvas than an arm laterally extended. The representation, then, of this effect of reduced space suggesting at the same time the actual length of the object, is termed foreshortening. It is practiced more or less by all painters as occasion demands, and it is always called for in the painted ceiling where figures are represented as above one's head. Some of the chief masters of foreshortening among the Italians were Melozzo da Forlì, Luca Signorelli, Michelangelo, Tintoretto, and, especially, Correggio, who, in his frescoes of

the cupola of Parma went further than had any before him. His example was followed by painters of the Baroque and Rococo period, who introduced foreshortening into their works merely for the purpose of parading their technical skill. In modern times greater care prevails, and foreshortening is practiced only with reference to the laws of perspective.

FOREST (OF. *forest*, Fr. *forêt*, It., ML. *foresta*, forest, from Lat. *foras*, *foris*, out of doors, *fores*, door, Gk. *θύρα*, *thyra*, OChurch Slav. *dviri*, Lith. *dūrys*, Goth. *daúrōns*, OHG. *turi*, Ger. *Thür*, AS. *duru*, Eng. *door*). A tract of land covered with a natural growth of trees. From the standpoint of vegetation the world may be roughly divided into forest, grassland, and desert, the area of each being determined by various climatic factors. Among these climatic factors atmospheric moisture takes a prominent place, as can readily be seen in comparing a vegetation chart of the world with a rainfall chart. Other things being equal, the greater the rainfall, the richer the forest. Forests seem to be in a measure independent of the seasonal distribution of rain, since they occur in regions of daily rain, of summer rain, or winter rain. Endurance through dry seasons is made possible by the great depth of tree-roots, and also by the thick and leathery leaf-texture in the case of evergreens, or by the shedding of leaves in deciduous trees. Because of the heat, more water is required by a tropical forest to meet the demands of transpiration than by a forest in the temperate zone. Another factor, perhaps of equal importance with moisture, is wind. Kihlman has shown that the presence or absence of trees in arctic regions is not a question of cold, nor even of a season's length, but of winter winds; trees grow only where they are protected from the great loss of water by transpiration induced by dry winter winds by being buried under the snow; the height of the trees thus marks the winter level of the snow. Since the winds of eastern Argentina are strong during the resting period, grassland is present, though the moisture is sufficient for a forest.

The forest formations of the world may be divided into eight types, based chiefly on the ecological characters of the leaves. (See LEAF.)

(1) The evergreen forest of the tropical regions of diurnal rainfall. This forest is especially well developed in the regions of the trade winds in oceanic climates, as of Brazil and Malaysia. This type is often called the rainy forest, and may be taken as representing the climax of the world's vegetation. Here plants grow in vast profusion and great diversity of form, and lianas, or climbing plants, and epiphytes reach their greatest development. Simultaneous periodicity is largely wanting, so that the forest is always in active life. (2) The deciduous monsoon forest, especially characteristic of the monsoon district of India, differs from the forest first named chiefly in having simultaneous periodicity. The other characters of the rainy season are present, but in a less complete degree. (3) The evergreen forest of the temperate zone is essentially an extension of the tropical evergreen forest into the cooler regions, especially of the Southern Hemisphere. It is peculiar to pronounced oceanic climates with markedly uniform temperature and moisture. (4) The deciduous forest of the north temperate zone is the typical forest formation of

the eastern United States. The forests of beech, maple, chestnut, oak, etc., are too familiar to need description. The radical difference between the forests of the same latitudes in the Northern and Southern hemispheres is doubtless associated with the continental climates of the one and the oceanic climates of the other. (5) The deciduous savanna forest of the tropical and warm temperate regions is transitional between forest and grassland (q.v.), having a park-like aspect, which is due to scattered trees in a district where grasses form the chief undergrowth. Such a forest commonly has a moderate rainfall. (6) The thorny or scrubby forest of tropical and warm temperate regions where the rainfall is slight is transitional between forest and thicket (q.v.). (7) The forest of temperate regions where the rainfall occurs in winter, is finely shown in the Mediterranean region; coarse and leathery but large evergreen leaves, like those of the holly, laurel, oleander, and the evergreen oaks, may be taken as typical of such regions. (8) The conifer forests, the pines and firs with their leathery, needle-shaped evergreen leaves, form great forests in the colder regions of the temperate zones, especially of the Northern Hemisphere.

The forests heretofore discussed are all climatic and widespread. Edaphic (q.v.) or local forests also occur. Indeed, in most of the regions where the above climatic types are found, there are localities in which other forest combinations are present. For example, in a swamp in the deciduous zone of the northern United States there may be found tamarack, spruce, and white cedar. Close observation in such a place for many years would doubtless show the gradual dying out of these trees and their replacement by the ordinary members of the deciduous forest. On a hill there may often be found a pine-plant society, but this is not a permanent condition. Pines are often likely to be followed in a natural sequence by oaks, and they in turn by maples and beeches. These changeable plant societies may be called edaphic, while the ultimate forest toward which all are tending may be called the climatic formation. Viewed in this light the eight great forest types outlined above are forest formations.

FORESTALLING. The buying of provisions with a view to enhancing the price thereof in open market. This was a common-law offense, and was the subject of early and repeated legislation. It was described by statute of 5 and 6 Edw. VI., ch. 14, as the buying or contracting for any merchandise or victual coming in the way to market; or dissuading persons from bringing their goods or provisions there; or persuading them to enhance the price when there. It was analogous to engrossing (q.v.) and regrating (q.v.). Modern conditions of trade have rendered these practices legitimate and the laws intended to regulate them obsolete; while at the same time the abuses referred to have, under the name of 'corners' and monopolies, become more flagrant and oppressive. The laws against forestalling, etc., were formally repealed in England by statute 7 and 8 Vict., ch. 24. In the United States they have remained unenforced. Consult the authorities referred to under CRIMINAL LAW.

FOREST CANTONS, THE FOUR. The four cantons of Schwyz, Uri, Unterwalden, and Lucerne, in Switzerland.

FOREST CITY, THE. A name given to Cleveland, Ohio, famous for its shade-trees.

FORESTER, FRANK. A nom-de-plume of Henry William Herbert (q.v.).

FORESTERS, ANCIENT ORDER OF. A fraternal organization founded in 1745 when a Court of Foresters was established at Knaresborough Castle, in Yorkshire, England. The Order has existed continuously since then, and was introduced into the United States in 1832, by the establishment of Court Good Speed, 201, in Philadelphia. The growth of the Order was slow until 1864, when Court Brooklyn, 4421, was organized. In 1902 the courts numbered approximately 9000, with a total membership of nearly 1,000,000. The Order is one of the largest beneficiary societies in existence, with courts in 36 countries, a reserve fund of \$36,000,000, and an income of \$6,000,000. Funds are raised by fixed dues, and more than \$5,000,000 annually are distributed in benefits.

FORESTERS, INDEPENDENT ORDER OF. A fraternal and benevolent society founded at Newark, N. J., in 1874, and reorganized in 1881. The Order is general throughout the United States and Canada, and has branches in Great Britain, Norway, France, India, and Australia. Its government is vested in a Supreme Court, with delegates from all the countries represented. High Courts, corresponding to the Grand Lodges of other societies, have supervision of the Order in various States and countries. Of these High Courts there were, in 1902, 20 in the United States, 8 in the British Isles, and one in Norway. The local bodies are called courts. The Order has a membership of some 200,000, has paid more than \$11,000,000 in benefits since its organization, and has a surplus fund of over \$5,600,000.

FORESTERS OF AMERICA. A benevolent and fraternal organization known under its present title since September, 1895. Originally the Order was part of the Ancient Order of Foresters, founded in England in 1745, and introduced in the United States in 1832. In 1889, however, the American Order freed itself from the jurisdiction of the High Court in England, and became a separate organization. It had, in 1902, some 1600 courts, or local branches, and a total membership of over 200,000. Its annual payments for benefits amount to \$1,000,000.

FOREST FLY. The British name of a small, widely distributed fly (*Hippobosca equina*), representing that aberrant division of Diptera styled Eproboscidea (see FLX) and the family Hippoboscidae. These minute insects are flea-like in appearance and habits, dwelling altogether as parasites among the hairs of animals and feathers of birds, and are sometimes called 'bird-ticks.' A common species on large birds in America is *Olfersia Americana*. Species of another genus, Lipoptera, have wings when young and live upon birds, but after a time they migrate to some mammal, and there, having no further use for their wings, wrench or bite them off. Another genus, Melophagus, includes the wingless sheep-ticks; a whole family, the spider-like bat-ticks (*Nycteribiidae*), inhabit the fur of bats alone; and another includes the bee-louse (*Braulidae*). All obtain their living by piercing the skin and sucking the blood with an extensile tube thrust

out from the mouth. It is in this manner that the forest fly torments horses, especially the short-haired, thin-skinned animals of high breeding. An extraordinary feature in the economy of all these flies is that they do not lay their eggs, but retain them until they hatch into larvæ, and the larvæ are almost ready to pupate; not until then are they extruded by the parent, and only one is produced at a time. Hence the group has been named Pupipara by some systematists.

FORESTI, fô-rês'tê, ELEUTARIO FELICE (1793-1858). An Italian patriot and scholar. He was born at Conselice; graduated at the University of Bologna, practiced law at Ferrara, and in 1816 was made prætor at Crespino. In 1819 he was arrested as one of the Carbonari, and was kept in prison until 1836, when he came to the United States. He was for many years professor of Italian in Columbia College, and in 1858 he was appointed United States consul at Genoa. He published an edition of Ollendorff's Italian grammar (1846), and *Crestomazia italiana* (1846).

FOREST LAWS (in England). Laws for the government of the forests in the King's possession. Such forests were vast tracts of country, containing not only woodland, but pastures and even villages, which might belong to other individuals than the King. Smaller tracts of woodland were called chases, or, if inclosed, parks, and might be included in a royal forest. The forests varied in number and extent at different times and were situated in different parts of the kingdom. Among the best known were New Forest, in Hampshire, Windsor Forest, and Epping Forest.

Most of them, indeed, dated from the Anglo-Saxon period, and having their origin in the uninclosed woodlands which had been national property, became royal demesne in the eleventh century. But all the Norman and early Plantagenet kings attempted, with varying success, to increase the forest area by afforestation, a summary proceeding, which consisted in simply proclaiming the desired tract a forest, after it had been inclosed with metes and bounds by royal commission. Sometimes the people were allowed to remain, but subject to the strict forest law; often they were ruthlessly driven away. The increase of the forest area was not only attempted by such high-handed monarchs as William I. and his sons. Until the fourteenth century it was a recurring source of complaint against the kings. Such wise kings as Henry II. and Edward I. were guilty of the same practice, and it was not until 1301 that the latter finally yielded to the wishes of his people, and permanently put an end to afforestation by force. When Henry VIII. created Hampton Court Forest, he was obliged to pay the freeholders for the lands of which he deprived them, and even Charles I. is said to have followed a like course when he created Richmond Park.

We have no means of determining the state of the law at the time of the Conquest. A series of enactments attributed to Canute is of such uncertain authority as to have been rejected by Coke in 1548, and Dr. Liebermann has recently shown that it is a forgery of about 1184. All that we know of his legislation on this subject is

that he permitted every man to hunt in his own wood, but forbade trespassing in the King's forest.

The terrible severities of the Norman period are usually said to have been introduced under Henry I., but in his charter of liberties Henry professes merely to retain the forests as his father had held them. His law claimed supreme jurisdiction over private forests as well as over his own, and prescribed terrible penalties for the killing of game, among which were death, blinding, and emasculation. The Assize of the Forest, issued by Henry II. in 1184, retains these punishments, but mitigates others and prescribes the limits of the jurisdiction of forest courts. The extreme rigor with which this otherwise just King enforced the forest law gave cause for great complaint. In the Great Charter John renounced his afforestments, promised reform of all bad customs, and excused from attendance on the forest courts those not living in the forest. The Charter of the Forests, issued by the Earl Marshal for Henry III. in 1217, was a still more liberal document, greatly diminishing the punishments, the severest of which is now imprisonment for a year and a day. Besides confirming the provisions of Magna Charta, it permits freemen to exercise many other rights, such as those to mills, fish-ponds, marl-pits, arable land, falcons, etc., on their own land, within the forest. Renewed by Edward I., and supplemented by another ordinance in 1306, it remained the basis of the forest laws of the kingdom.

In general, the inhabitants of the forest folds were subject to the royal rights of forestry. These were both of *vert*, that is, to every kind of tree and brush in the forest, and *venison*, that is to say, to every wild beast of the forest. They were not allowed to hunt or cut wood or brush on their own land without license of the royal official. They, indeed, retained some rights of pasture for *commonable* beasts (excluding sheep, goats, geese, and swine), but they might not use as much as would deprive the King's beasts of food.

The officers of the forest were numerous and important. The master forester seems to have been independent even of the justiciar. There were two justices in eyre, one for this side of Trent and the other for beyond. The verderers were chosen in pursuance of royal writ by the freeholders of the forest from their own number to maintain the law. Besides the foresters, who were freemen sworn to preserve *vert* and *venison* in their respective bailiwicks, there were other minor officials.

The forest courts were three in number, running parallel with the ordinary courts of justice. There was the *woodmote*, or court of attachments, held before the verderers every forty days. It tried minor trespasses only, and could not convict. The *swanmote* was held three times a year by the same officials, all freeholders of the forest being bound to attend. Presentments were made by a jury which tried and convicted, but did not pass judgment. This was reserved for the justices in eyre, who every third year held the *court of justice seat*, a supreme court of civil and criminal jurisdiction over all offenses committed in a forest, whether against the forest law or not.

The last important general forest legislation was passed by the Long Parliament in 1640.

Charles I. had been exacting fines for alleged encroachments on his forests, and Parliament replied with an act for the 'certainty of forests,' exempting from prosecution any alleged encroachments which were considered valid in the second year of James I. Since that act the laws of the forest have practically ceased. The Crown still retains ancient forestal rights over private lands in Dean Forest and in New Forest, but such rights survive as curious legal anomalies. During Queen Victoria's reign three of the royal forests, viz. Hainault, Whittlewood, and Wichwood, were disafforested by act of Parliament. It would be better, however, if the remainder, and particularly such as are near large cities, could be held as national parks and recreation grounds. This has recently been done in the case of Epping Forest near London, and seems to be the probable destiny of others as well.

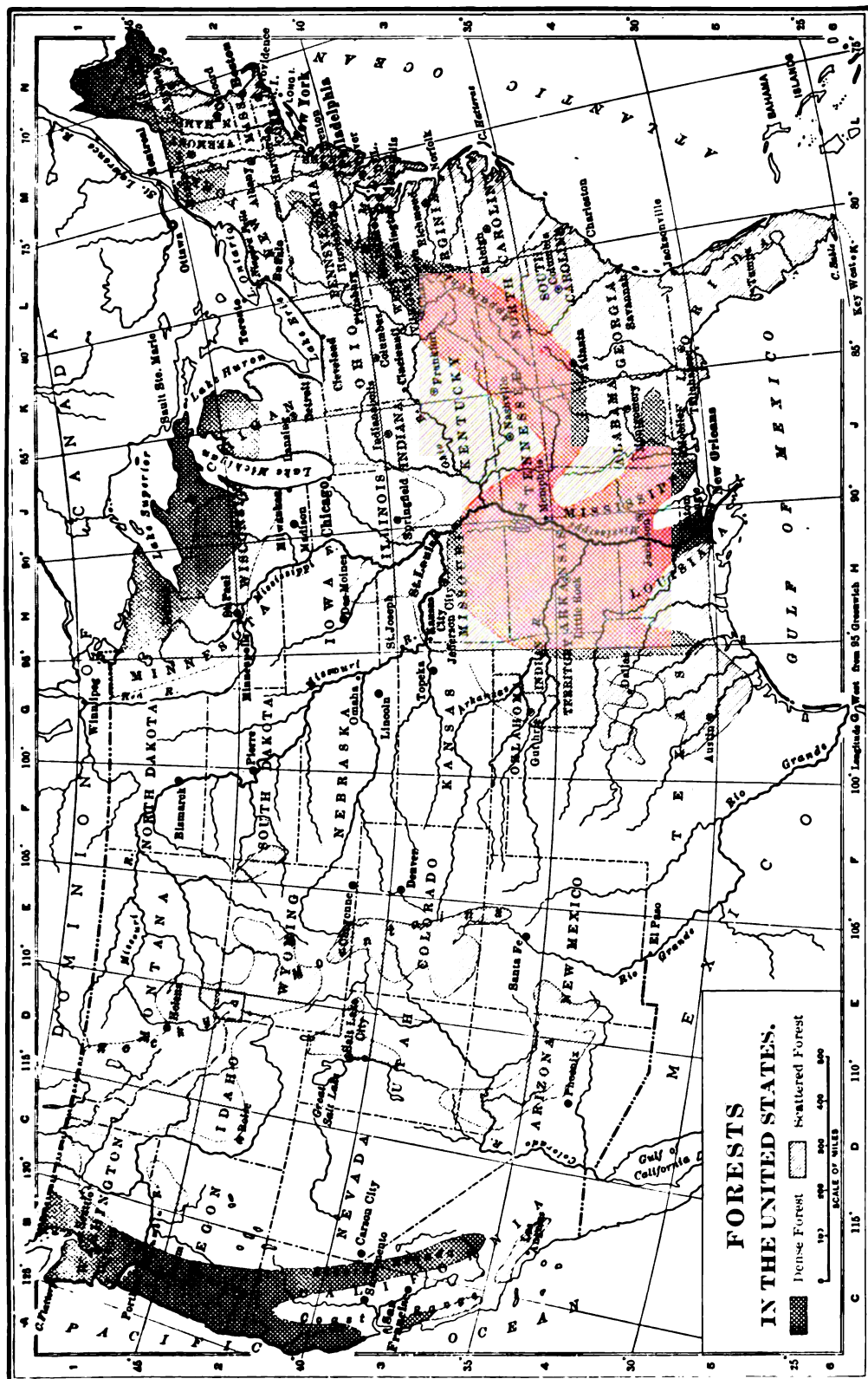
The royal forests of Scotland were nearly as numerous as those of England, and their area was larger in proportion to that of the country. As in England, there was a special code for them. Indeed, this code is so much like the English that it seems to have been derived from it. The penalties, however, are not so severe, nor did afforestation play such a prominent part in the Scotch constitutional struggle as in the English. The best edition of the Scotch forest code is in the *Acts of the Parliaments of Scotland* (Edinburgh, 1844).

BIBLIOGRAPHY. Most of the laws of the forest are given in convenient form by Stubbs, *Select Charters* (Oxford, 1895), as cited above; they are published in full in the *Statutes of the Realm*, Record Commission, vol. i. (1810); Coke's *Fourth Institute of the Laws of England* (London, 1548) is the earliest legal authority, and the most complete is Manwood's *Treatise of the Laws of the Forests* (London, 1598). For good brief modern descriptions, consult: Stubbs, *Constitutional History*, i. (Oxford, 1891); and "Forest Laws," in the *Encyclopædia of the Laws of England*, ed. by Ranton (London, 1895-98).

FOREST OAK. A name sometimes given in commerce to the timber of *Casuarina torulosa*, and other species of the same genus, all Australian trees. In Queensland the wood is considered as one of the most valuable for fuel, and is also split into shingles. It is light yellowish-brown and prettily marked with short red veins. It is exported for use in cabinet-work, for which purpose it is employed as veneer.

FOREST PRESERVATION. See FORESTRY; LUMBER INDUSTRY.

FORESTRY (from ML. *foresteria*, *forestaria*, *forestage*, from *foresta*, forest). The economic management of trees as communities. It is distinct from arboriculture, which is more strictly concerned with the individual tree. Forestry looks to the conservation and utilization of the various forest products in order that the greatest returns may be obtained. It may apply to the planting of a new forest or the preservation of an old one, the reforestation of a mountain-side, the prevention of ruthless forest destruction, or the utilization of the forest products as a crop. The uses of a forest are to supply timber, fuel, etc.; to offer protection against winds; to conserve moisture, by storing up water or at least by checking its loss by seepage and evaporation;



and to minister to the enjoyment of man in providing parks, game-covers, etc. In many new countries forests are considered detrimental to the growth of the varied interests upon which the new community is dependent, and they are removed as rapidly as possible. In old ones the lack of forests is keenly felt in various ways, and attempts have been made to restore, in part, the former wooded areas.

HISTORY. In some form, forestry has been practiced in Europe for several centuries. The growing scarcity of timber and fuel began to be felt in England early in the sixteenth century, and attempts were made to supply the failing resources by making new plantations and by more scientific cutting of the native growth. About the beginning of the eighteenth century plantings were begun in Scotland and later in Ireland; now the artificially planted areas exceed the natural ones. About this time there was great activity in the introduction of foreign species of forest trees, many of which were so well adapted to their new conditions that in places there are to-day more exotic than native trees. In France, Belgium, Germany, and other parts of Europe extensive areas of forests are now under systems of management that result in increasing rather than in decreasing production. Old native forests have been cared for, and denuded areas reforested. Governmental, communal, and private forests alike are so managed as to provide the various objects for which they were designed. In Germany and France the management of forests has received the greatest attention, and has been most systematically and scientifically conducted. Government schools are maintained for the education of skilled foresters, and special attention is paid this important subject.

FORESTRY IN THE UNITED STATES. Forest regulation did not for a time seem as necessary in the United States, with its great forest wealth, as in Europe. However, with the destructive methods of lumbering and the enormous waste by forest fires, the supply has been so encroached upon that means have been taken to repair the damage and to provide against its continuance. Various States have enacted laws designed to correct the former abuses by granting bounties for tree-planting and remission of taxes upon purely forest areas. The general Government has also attempted to aid by laws providing for the acquirement of land upon the condition of planting a portion to trees. Since the laws enacted by the general Government were improperly prepared, interpreted, and enforced, and have resulted in little good, they have been repealed. The greatest good has probably come from the reservation of extensive areas about the watersheds and sources of some great rivers. There were in 1899 36 forest reserves in the United States, embracing more than 46,000,000 acres. They are as follows: Grand Cañon, San Francisco, Black Mesa, and Prescott in Arizona; Pecos and Gila River in New Mexico; Stanislaus, Sierra Forest, Lake Tahoe, Pine Mountain, Zaca Lake, San Bernardino, San Gabriel, San Jacinto, and Trabuco Cañon in California; Battlement Mesa, Pike's Peak, Plum Creek, South Platte, and White River in Colorado; Fish Lake and Uintah in Utah; Bitter Root and Priest River, in Idaho; Bitter Root, Flathead, Lewis and Clark, and Gallatin, in Montana; Cascade, Bull Run, and Ashland, in Oregon; Black Hills, Teton, Yellow-

stone, and Big Horn, in South Dakota and Wyoming; and Priest River, Olympic, and Mount Rainier, in Washington. In addition there are a number of State reserves, the object of which is mainly to prevent the too rapid escape of water in floods, and the succeeding periods of scanty water-supply for irrigation and other uses. They are situated at the sources of water-supplies, and are patroled to insure their safety against marauders and fires.

FOREST TREES. Forests are of two kinds, pure and mixed. The former are less common than the latter, and are usually, though not always, composed of coniferous trees. One advantage of a pure forest is the greater ease in lumbering; one disadvantage is its liability to destruction by drought, insects, diseases, etc. Among species adapted to pure forests are pines, spruce, silver fir, Douglas fir, beech and maple. Those doing best in mixed woods are larch, birch, poplar, ash, oak, chestnut, and walnut. Mixed forests can be grown, and often are grown as a series of small colonies devoted to single species, but for general purposes mixed woods are most satisfactory. Since the requirements of different species differ as to light, moisture, and soil, the trees of mixed forests protect each other, and the forest floor, as the ground is called, better than those of pure forests.

REFORESTATION. Forests when once depleted are restocked in several ways. Although the setting out of young trees is one of the most expensive methods of restocking, it has been practiced to some extent in the plains region of the United States, and extensively in England. The seeds are sown and the young trees reared in nurseries where the peculiar requirements of the seedlings can be carefully met. After a growth of several seasons the trees are set in the places where they are to grow. Where the surface of the land will permit, they are often cultivated like any other crop until they attain a size sufficient to care for themselves. Frequently, too, crops of corn are grown in the spaces between the rows. While expensive, this method is best adapted to the conditions in the prairie region of the western United States. A second method is that of hand-seeding the region designed for the future forest. This method is followed in many places, but the difficulties of collecting and caring for the seed prior to seeding are so great as to make this method unsatisfactory. Natural seeding is largely depended upon to restock scientifically managed forests, occasional seed-bearing trees being left for the purpose. In some places the practice of thinning out the growth is followed to give the new stock of seedlings the air and light they require. Lastly, sprouts or suckers from the stumps and roots of trees that have been cut are often used for restocking. This method will apply only to such broad-leaved species as renew themselves in this way. They should be cut while dormant. This is about the only way employed in the reproduction of coppice woods. (See CORSE.) As a rule the conifers do not sprout from their stumps. Pruning and thinning must be given some attention. Natural pruning is most satisfactory, and will be done by the trees themselves if they are planted close enough. In natural pruning the lower twigs and branches die because close planting prevents their obtaining sufficient light. In time these dead parts are broken off and their stubs

are buried by the trunk as it increases in girth. Thinning, on the other hand, must be done from time to time so as to prevent overcrowding. When branches are cut off, the cut should be close to the main trunk, and where the wound is too large to heal over in a single year or possibly two, the cut surface should be protected against the entrance of fungi by painting it.

ECONOMIC RETURNS. The financial returns from forests depend upon a number of factors, but in any case they are tardy. In copses the whole area may be cut over every twenty or thirty years, while forests grown for timber must of necessity be of greater age. By conservative management, where the land is not too valuable at the beginning and markets are convenient, it is believed that four per cent. can be realized in European forests, and there are records of even greater returns in the United States. A ten-year-old plantation of hardy catalpa in Kansas is said to have yielded a net gain of \$197.55 per acre, which sum could have been increased by continuing the marketing over a longer period.

Since it has been shown that private holdings of forest areas can be so managed as to be a source of continual revenue without impairing the original capital, many large owners are availing themselves of the opportunity offered by the Government to secure the aid of expert foresters in planning their management. To provide experts schools of forestry have been established at Cornell and Yale universities, and forestry instruction is given in the agricultural colleges of a number of States.

CLIMATIC INFLUENCE. The climatic influences of forests are very great. Whether forests are actually instrumental in securing greater rainfall is somewhat problematical. Observations covering a long period of years and a large extent of forest are not sufficiently abundant to determine this point. That they do aid very materially in conserving moisture is not to be denied, and as a factor in the distribution of water they are equally important. In tempering hot and cold winds and as wind-breaks, they are of great importance. The temperature in a forest is lower in summer and warmer in winter than in an adjacent open tract, and this influence may be exerted to a considerable distance. The use of forests as a means for reclaiming tracts of almost barren sand and for protecting regions against wind-shifted sand are well shown by some of the forests of France.

FOREST ENEMIES. The worst enemies of forests are man, through the agency of destructive lumbering, forest fires, grazing of animals, especially sheep: insect attacks, and fungous diseases. Mixed forests are not so subject to great loss from the last two causes as pure woods, since the same fungus or insect seldom attacks any great number of species of trees. Public sentiment, knowledge of how to prevent the other losses, and how to make forestry profitable, must protect against the other enemies. See ARBORICULTURE; FOREST.

FORESTRY ASSOCIATION, AMERICAN. An association to further the conservation, correct management, and renewal of forests: to collect forest statistics, and to promote legislation for those ends. The excessive waste of forests in the United States, the destructive forest fires, and the no less destructive methods of cutting, led to the formation of the Forestry Association in 1875, in the hope of correcting these evils. The

association merged in 1882 with the American Forestry Congress, organized that year in Cincinnati, Ohio, and it was incorporated in 1897. The society has had the support of the Department of Agriculture of the Federal Government, and has coöperated with various State and local forestry associations. Annual meetings are held, at which papers are read covering all aspects of the forestry question, and the *Proceedings of the American Forestry Association* are published annually at Washington, D. C. *Forestry and Irrigation*, a monthly journal, is also published.

FOREY, fô'rá', ELIE FRÉDÉRIC (1804-72). A French soldier. He was born in Paris, was educated at Saint-Cyr, accompanied an expedition to Algeria in 1830, and in 1852 attained the rank of general of division. He was conspicuous in the Crimean War and in the Italian campaign of 1859, and in 1862 was sent to Mexico as military and civil administrator and Minister Plenipotentiary. He promised the Mexicans that their liberties should be preserved and their rights respected, but he nevertheless sequestered the goods of many of those who were opposed to Maximilian. Puebla surrendered on May 17, 1863, after a long siege. The City of Mexico was soon occupied, and a provisional government was formed. Forey was, however, replaced by Bazaine, became a marshal in the same year, and soon afterwards was given command of a corps d'armée.

FORFAIT, fôr'fá', PIERRE ALEXANDRE LAURENT (1752-1807). A French engineer, born at Rouen. In 1773 he was elected a member of the Academy of Rouen, in 1781 became an engineer in the French navy, and in 1787 was intrusted with the construction of packet-boats running between France and the French colonies, and to the United States. In 1791 he was elected from Seine-Inférieure to the Constituent Assembly. He was charged by Napoleon with the naval preparations for the invasion of Egypt, and from 1799 to 1801 was Minister of Marine and the Colonies. Subsequently he was appointed a councillor of State, and inspector-general of the fleet designed to be employed in the invasion of England. He was the inventor of the Seine boat, wrote many scientific papers, and published a *Traité élémentaire de la nature des vaisseaux* (1788).

FORFANG, or FOREFANG (Sax. *fore*, before, and *fangen*, to take). In old English law, the offense of buying up provisions, grain, etc., at a fair or market, before the King's purveyors were served with necessities for his Majesty. It is denounced in a charter of Henry I. in 1133, but has long been obsolete. The term *forfang* was also used in Anglo-Saxon law to describe the lawful recovery, by force and arms, of stolen or strayed cattle from a thief, or from those having illegal possession of them, as well as the reward fixed for such rescue.

FORFAR, fôr'fär. The county-town of Forfarshire, Scotland, a Parliamentary and royal burgh situated in the Vale of Strathmore, 14 miles north-northeast of Dundee (Map: Scotland, F 3). The Scottish Midland Junction Railway connects it with Aberdeen. Linen is its staple manufacture. Supposed to be the ancient *Orrea*, it was once the seat of the Scottish kings. David I. (1124-53) made it a royal burgh. In 1308 Bruce destroyed the castle, and according to

Boece, Forfar by 1526 had dwindled to 'a country village.' Since the middle of the eighteenth century it has grown into a prosperous town. Population, in 1891, 12,844; in 1901, 12,061. In the neighborhood is Glamis Castle, the seat of the Earl of Strathmore.

FORFARSHIRE, or ANGUS. A maritime county in the East-Midland Division of Scotland, bounded east by the North Sea, north by Kincardineshire and Aberdeenshire, west by Perthshire, and south by the Firth of Tay (Map: Scotland, F 3). Area, 875 square miles. The surface of the county is irregular, and intersected with hills, the Sidlaw being 1400 feet high, and Catlaw, the highest, 2264 feet. The chief rivers are the Tay, North Esk, South Esk, and Isla. Forfarshire is an agricultural county, and also the chief seat of Scotch linen manufactures. Capital, Forfar; other important towns are Dundee, Montrose, and Brechin. Population, in 1801, 99,000; in 1851, 191,260; in 1901, 284,000. Consult Warden, *Angus or Forfarshire* (4 vols., Edinburgh, 1880-83).

FORFEITURE. The loss of title to property, as a punishment for crime or other unlawful act. Personal as well as real property is subject to forfeiture, and the penalty may be incurred for civil as well as for criminal offenses. The forfeiture of lands was a penalty of the feudal law, and was a direct consequence of the feudal relation of landlord and tenant. This relation was primarily personal and confidential, the lord owing protection to his vassal, and the vassal being bound to the highest degree of loyalty and devotion to his lord. As it was this feudal relation of interdependence which made the vassal a legal person (*homo legalis*)—i.e. a member of society protected by the political organization of the State and its machinery of justice—so the rupture of this feudal relation by any disloyalty operated at once to render the tenant a man without law, a lawless man, or outlaw. As he held his lands, his goods, and even his life on the condition of loyalty to this feudal bond, its breach naturally involved the forfeiture of these.

FORFEITURE FOR CRIME. The penalty of forfeiture for treason prevailed in England before the Conquest, as is clear from the fact that lands held in gavelkind, which is a Saxon tenure, may be forfeited for treason. But after the Conquest forfeiture of lands and goods came to be regarded as the peculiar punishment of felony, of which treason against the sovereign was the highest kind, and was denominated high treason, to distinguish it from all other felonies, which were called petty treason. In cases of treason the offender forfeits all his lands absolutely to the Crown. Upon conviction of felony, according to the old law, the offender forfeited to the Crown the profits of all estates of freehold during his life, and all his estates in fee simple for a year and a day, after which they became escheat to the lord. The Crown, during the year of occupancy, was entitled to commit upon the lands what waste (q.v.) it pleased. By Magna Charta this power of committing waste was restrained. But by 17 Edw. II., c. 16, the King's right to waste was again recognized. In all felonies the goods and chattels of the offender are, on conviction, forfeited to the Crown; but until conviction forfeiture of the goods does not operate. Where, therefore, a person has disposed of his

goods before conviction, the Crown cannot reach them. Forfeiture of lands does not take effect until sentence of attainder (q.v.) has been pronounced. So that a person committing *felo de se* (q.v.), or a rebel dying before sentence, or killed in open rebellion, does not forfeit his lands. But sentence of attainder, as soon as pronounced, has a retroactive effect, and annuls all conveyances made between the act of treason or felony and the pronouncing of sentence. Conveyances made before the act of treason are not affected. Hence, a wife's jointure is not forfeited, because settled on her before the commission of the act. The same thing is true of the wife's dower in all lands of which her husband was seized prior to the commission of the treasonable acts charged.

Forfeiture for treason and felony is accompanied by *corruption of blood*, whereby the offender is incapable of inheriting any lands or of transmitting any title to an heir. It was this doctrine which produced the escheat of forfeited lands, to which reference has been made above. The tenant, having been cut off by his crime from all human relationships, his blood being corrupted—i.e. bastardized and rendered illegal—by the attainder, has no lawful heirs to whom the lands can descend, and there being thus a failure of heirs, the land escheats to the lord of whom it is held. (See *ESCHEAT*.) By 7 Anne, c. 21, it was enacted that after the death of the Pretender and his sons no attainder for treason should operate to the prejudice of other than the offender himself; but this provision was repealed (39 Geo. III., c. 93). In 1870, however, the Crown's claim of forfeiture was abolished in all cases but outlawry (Forfeiture Act, 33 and 34 Vict., c. 23, § 1), and in 1879 (42 and 43 Vict., c. 59, § 3) outlawry in civil cases was also abolished.

In the United States conviction of felony has never been attended with forfeiture, and the penalty of forfeiture for treason is confined within narrow limits by the Federal and State constitutions. See *ATTAINDER*.

CIVIL FORFEITURE. Civil forfeiture may be incurred in England in five ways—viz. by tortious alienation, by wrongful disclaimer, by alienation in mortmain, by breach of condition, and by the commission of waste. The first three of these modes were incidents of the feudal tenure of lands; the last two were introduced by statute. It must be observed that, according to the earliest feudal customs, a gift of lands was always made in favor of a particular person, and that alienation, without consent of the overlord, involved a forfeiture of the fee. But this strictness having by degrees ceased to be observed, forfeiture was only incurred in case of a tortious alienation. Tortious alienation was where the owner of a particular estate conveyed by common-law conveyance, as feoffment, fine, or recovery, a greater estate than that to which he was himself entitled, as where a tenant for life made a feoffment in fee. The immediate effect of this act was the forfeiture of the land to the remainderman or reversioner. By 3 and 4 Will. IV., c. 74, abolishing fines and recoveries, and 8 and 9 Vict., c. 106, § 4, declaring that feoffment should not have a tortious operation, forfeiture by tortious alienation has ceased to have practical importance. (See *FEOFFMENT*.) Forfeiture by wrongful disclaimer was where a tenant holding

of a superior lord, on being summoned in any court of record, either disclaimed his allegiance or did any act which amounted to a disclaimer. Since the abolition by the statute *quia emptores*, or subinfeudation, this species of forfeiture can only arise in lands held of the Crown. Forfeiture by alienation in mortmain is incurred by the conveyance of lands or tenements in favor of any corporation (q.v.), sole or aggregate, ecclesiastical or temporal. As by vesting the land in a tenant of this description the overlord was deprived of all the duties and services due by his vassal, this act was declared by various acts of Parliament to involve the forfeiture of the lands. (See MORTMAIN.) Forfeiture of copyholds was incurred by committing waste, and by other acts of a wrongful kind inconsistent with the fealty due to the lord. By the statutes of Marlborough (52 Hen. III., 1267) and Gloucester (6 Edw. I., 1278), the penalty of forfeiture was affixed to the commission of waste by any tenants for life or for years, as well as by guardians in chivalry. (See WASTE.) Forfeiture on breach of condition subsequent is where an estate is held upon a condition contained in the grant itself. On failure of the condition the grantor or his heirs may enter upon the lands. See CONDITION; ENTRY, RIGHT OF.

In Scotland civil forfeiture may arise either from statutory enactment, at common law, or by agreement. By a statute of 1597 it was enacted that vassals failing to pay their feu duties for two years should forfeit their right. This forfeiture must be established by an action to recover the feu duties in arrear, and might be avoided by payment at the bar. At common law, a vassal forfeited his land by disclamation or purpresture. The former is analogous to the English disclaimer, and consists in the denial by a vassal of his lawful superior. Purpresture was incurred by the vassal's encroachment on the streets, highways, or commonalties belonging to the Crown or other superior. These forms of forfeiture are fallen into disuse. Forfeiture on special agreement depends wholly upon the terms of the condition inserted in the titles. See FEE; FEUDALISM; LIEUTANCY; TENURE.

In the United States civil forfeiture is generally limited to acts of waste committed by tenants for life or years, and to the breach of conditions upon which lands are granted, and in a few States even these have been abolished. But there are certain offenses in regard to which particular statutes have been enacted by Congress exacting the forfeiture of property employed as a means of committing the wrongful act or used in an unlawful transaction; but forfeiture in such cases applies only to the particular property designated, and not generally to chattels or lands, as in the other instances which have been maintained. Thus, laws have been passed from time to time providing that smuggling or importation of goods under fraudulent invoices shall cause a forfeiture either of the entire invoice or of the property wrongfully imported. Acts of piracy entail a forfeiture of the piratical craft and its appurtenances. The same was true of vessels engaged in the slave trade.

FORGÁCH, or **FORGÁCS**, fôr'gách. A noble family of Hungary, which traces its origin to the time of King Stephen. FRANCIS FORGÁCH (1510-75) was Bishop of Grosswardein (1556-67). He

took part in the Council of Trent. He afterwards traveled to Italy and wrote, *Rerum Hungaricum Sui Temporis Commentarii Libri XXII.*, 1540-1572, republished in 1866 by Major in the *Monumenta Hungariae Historica*. The more recent members of the family include: Count IGNATIUS FORGÁCH (1702-72), a general under Maria Theresa, and Count ANTON FORGÁCH (1819-85), who held several offices under Ferdinand and Francis Joseph. From 1861 to 1864 he was High Chancellor, and was a staunch supporter of the old Conservative Party. After 1869 he was Deputy in the Hungarian Diet.

FORGE, FORGING (from OF. *forge*, from Lat. *fabrica*, workshop, from *faber*, smith). A forge is a furnace or open fire, commonly fitted with a bellows or air-blast, for heating metal which is to be formed into special shapes by forging; forging is the process of hammering or pressing hot metal into special shapes for use in engineering and the arts. Forges are made in all sizes, from the miniature gas-heating device used by jewelers to the great furnaces for heating steel ingots, armor-plates, engine-shafts, etc., weighing many tons; and they may be either fixed or portable. Portable forges are usually constructed of metal, and are of small size; they comprise a shallow pan or hearth for the fire, a bellows or fan for blowing the fire, and the hand or power mechanism for operating the blast-producing device. Fixed forges are usually built of masonry with an interior lining of fire-brick or other refractory material, and the blast is produced by power blowers.

Originally forging was a hammering process solely, but recently forging by presses has come into use, especially for making heavy forgings of steel. Forging by hammering may be done either by hand or by power. Hand hammering or forging is usually confined to the production of small forgings or to finishing large forgings produced by power hammers. The process is a simple one, and is familiar to any one who has observed a blacksmith fashioning horse-shoes or similar small articles. Power forging by hammers is nothing more than the hand-hammering process accomplished by means of heavy hammers operated by steam or other power. (See HAMMER.) It is employed in the production of large forgings for engines and machinery. Forging by presses consists in substituting for the power hammer, with its sudden heavy blow, a hydraulic press which squeezes the metal into shape by a comparatively slow, steady pressure. Steel forgings for engine-shafts, armor-plates, etc., are usually made by pressing. The process may be illustrated by tracing the operations conducted in forging a modern hollow steamship shaft. An ingot of open-hearth steel of proper chemical composition to give the necessary physical properties is cast approximately twice the size of the finished shaft. The metal is then submitted, while liquid, to hydraulic pressure of 7000 tons, or thereabouts, until cold, great care being taken to cool the ingot slowly and equally on all sides to prevent strains or cracks from forming on account of unequal contraction. When the ingot is cold, the sand from the mold which has adhered to it is cleaned off, and then, if intended for a small shaft, it is ready for the forging process proper. If the shaft is to be of more than 12 or

14 inches in diameter, a hole is bored through the axis of the ingot. The size of this hole varies according to the size of the shaft and the service to which it is to be eventually subjected. Generally speaking, however, it is made from one-third to two-fifths the diameter of the finished shaft. The first operation in the process of forging is the reheating of the ingot. This is a very delicate operation. Great care must be taken to insure a slow and uniform penetration of the metal by the heat, as there is, otherwise, danger of expanding the surface metal so rapidly that it will crack away from that underneath, which has not been heated to the same temperature. The hole in the centre of large ingots allows the interior and exterior to heat up and expand together, thus relieving this tendency to crack. When the ingot is heated, it is forged into shape under a slow-moving hydraulic press of from 2000 to 5000 tons capacity instead of the rapid steam hammer of from 5 to 25 tons falling weight. In the case of the hollow ingot, a steel mandrel is inserted, of a size to fit loosely into the hole, and the metal is forged down in the same manner as is employed with a solid shaft. Generally the shaft, if very long, has to be reheated one or more times during the forging. The finishing process consists in annealing or tempering the shaft, when it is ready to be machined.

Many small articles of common use are forged by machinery. Balls, screw and rivet blanks, nuts, nails, etc., are among the more familiar machine-forged articles. In general the process consists in inserting steel bars, heated to the proper temperature and of suitable cross-section, into a machine automatically operating, which cuts off the proper lengths and stamps or presses it into shape between dies. The process is a continuous one, one heated rod being inserted after another as fast as the machine will handle them. Many articles of intricate pattern are drop-forged. In this process an upper and lower die are employed. The lower die is placed on the anvil of a drop-hammer, the heated piece of metal placed on it, and the upper die placed on top of the heated metal. A hammer falling from a height strikes the upper die, and thus stamps the plastic metal into shape between the dies. Drop-hammers are made of various sizes; the largest now in operation has a 3000-pound hammer.

FORGERY (Fr. *forger*, to form metal into shape, to fabricate). The *crimen falsi* of the Roman law is held in English common law to be the fraudulent making or altering of a writing or seal, to the prejudice of another man's right, or of a stamp to the prejudice of the revenue. As regards writings, the instrument forged must be executed with such skill or in such circumstances as to be capable of being mistaken for a genuine document by a person of ordinary intelligence and observation. It is not necessary that there should be even an attempt at imitation. If there was intention to deceive, and the circumstances were such as to render deception possible, the crime has been committed, and consequently it is possible to forge the name of a person who cannot write. Any material alteration, however slight, is a forgery just as much as the subscription of the name of the pretended maker, or the fabrication of the entire writing. It will not lessen the crime, though the whole writing should be genuine, the name only being forged, or the name being really the hand-

writing of the party to whom it belongs, but appended to a forged writing. Even if the name be a fictitious one, but appended for the purpose of deceiving, a forgery has been committed just as much as if it belonged to a real person. The offense is not limited to the fabrication of writings, using that term in its literal sense. It includes the fabrication of printed or engraved instruments, such as railroad tickets, corporation certificates, bonds, etc. Falsely painting an artist's name on a picture is not forgery, however, for the picture is not a document or writing. Moreover, the document fabricated must have an apparent legal efficacy. A letter of introduction, though requesting a personal favor for the bearer from the one to whom it is addressed, is not a subject of criminal forgery, as it does not purport to confer any legal right or to impose any legal duty. At common law forgery is a misdemeanor, punishable by fine and imprisonment, or both.

To secure a conviction for forgery it is necessary to prove an intent to defraud, but it is not necessary that the purpose should have been actually effected; it is sufficient to show that the forgery would have proved injurious to another's interests. The different State laws in this country generally define specific offenses as constituting the crime of forgery, but these laws do not interfere with the character of the offense at common law, but simply provide a special and increased punishment in such cases as they particularly enumerate. Consult: Stephen, *History of the Criminal Law of England* (London, 1883); and the bibliography under **CRIMINAL LAW**.

FORGET-ME-NOT (*Myosotis*). A genus of, annual or biennial herbs of the order Boraginæ with small, generally blue flowers. The genus is distributed over the temperate zones in all quarters of the world, and a number of species are common in America, growing chiefly in ditches and damp meadows. *Myosotis palustris* and the closely related *Myosotis laxa* have crooked, creeping perennial roots, an angular stem one to two feet in height, and calyx covered with appressed bristles. *Myosotis sylvatica*, with calyx covered with stiff spreading hairs, grows in bushy places and woods, and is often planted in flower-gardens. It is especially admired for the size and brilliancy of its flowers. The dark-blue forget-me-not of the Azores (*Myosotis Azorica*) is cultivated in Europe, but requires the greenhouse. The genus is a favorite with most persons, both because of the brilliancy of the flowers, and because it is generally regarded as the emblem of friendship. The English name, scorpion grass, is now seldom heard. The German name, *Vergissmeinnicht*, corresponds with the English forget-me-not. *Myosotis versicolor*, very common in Great Britain, often as a weed in gardens, is remarkable for the change of color in the very small flowers, which are first yellow, then blue. Some species occur in such great abundance in parts of Alaska as to color the hillsides. *Myosotis verna* is rather abundant in dry places of the eastern United States during May and June.

FORKBEARD (so called from the apparent bifurcation of the ventral fins). A British hake (*Phycis blennoides*), also called hake's dame (q.v.), the ventral fins of which are long and filamentous.

FORK'EL, JOHANN NIKOLAUS (1749-1818). A German writer on music. He was born at Meeder, Saxe-Coburg, was organist to the University Church in Göttingen, and later director of

music at the university. Though he acquired considerable reputation as organist and harpist, his chief interests were the theory and the history of music. Noteworthy is his *Allgemeine Geschichte der Musik* (2 vols., 1788-1801).

FORKS (AS. *fora*, Icel. *forkr*, OHG. *furka*, Ger. *Furke*, from Lat. *furca*, fork). Forks, as table instruments, are only about three centuries old. The Greeks, Romans, and other ancient nations knew nothing of them. In ancient times, as is the practice still in the East, meat was commonly prepared in stews; or, if roasted, it was cut into small pieces by a carver so as to be easily taken in mouthfuls by the guests, who used their fingers and a knife for the purpose. The use of any species of forks at table was quite unknown till the fifteenth century, and then only in Italy. None of the sovereigns of England had forks till after the reign of Henry VIII., all persons, high and low, using their fingers. The first royal personage in England known to have had a fork was Queen Elizabeth; but, although several were presented to her, it is doubtful whether she ordinarily used them.

In England forks were employed only by the highest classes at the middle of the seventeenth century. About the period of the Revolution of 1688, few noblemen had more than a dozen forks of silver, along with a few of iron or steel. At length, for general use, steel forks were manufactured at Sheffield. They had at first but two prongs, and it was only in later times that the three-pronged kind was made. As late as the early part of the eighteenth century table-forks were kept on so meagre a scale by country inns in Scotland (and perhaps also in some parts of England) that it was customary for gentlemen in traveling to carry with them a portable knife and fork in a case. The general introduction of silver forks into Great Britain is comparatively recent; it cannot be dated before the opening of the Continent to English tourists in 1814.

FORKTAIL. A name applied to various birds having noticeably forked tails, as the scissor-tailed fly-catcher (see Plate of **FLY-CATCHERS**) or a kite. Specifically it denotes a group of small black-and-white insectivorous birds of mountainous regions from Northern India to Borneo, which have long forked tails kept incessantly in motion. They constitute the genus *Henicurus*, and place their nests beside a stone or log, near the edge of small streams.

FORLÌ, fôr-lê'. The capital of the Province of Forlì, in Central Italy, on the right bank of the Montone, 40 miles southeast of Bologna (Map: Italy, G 3). In the churches of Santi Biagio e Girolamo and San Mercuriale, named after the first Bishop of Forlì, are paintings by Palmezzano and others. The imposing Cathedral of Santa Croce has been almost entirely rebuilt since 1844. In the Church of San Pellegrino is a fine fifteenth-century tomb. The collection of paintings in the municipal Pinacoteca is important. The citadel, built in 1361 by Cardinal Albornoz, is now used as a prison. Forlì has a lyceum, a seminary, a technical institute, a library, and a hospital (founded in 1636). It markets grain, wine, cattle, silk, and hemp, and manufactures machinery, pottery, and furniture. The ancient Forum Livii is said to have been founded by and named after Livius Salinator, in B.C. 207, after his victory over Hasdrubal. Early

in the Middle Ages it was part of the Exarchate of Ravenna, changed masters during the struggles of Guelphs and Ghibellines, and was annexed to the Papal States in 1512 by Julius II. Population, in 1881, 41,000; in 1901, 43,708.

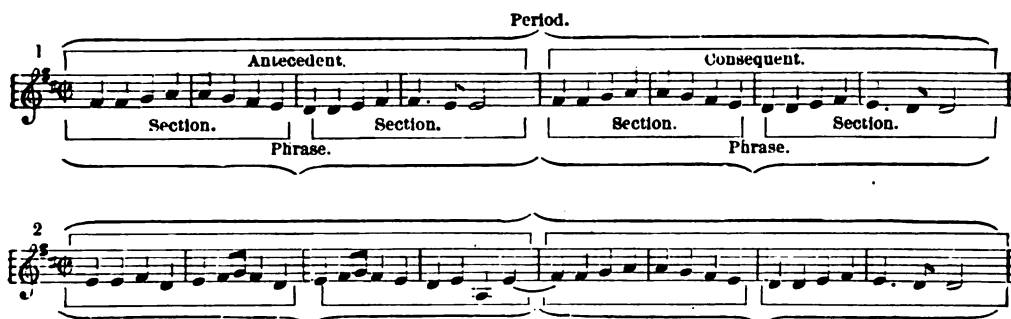
FORLÌ, MELOZZO DA (c. 1438-94). An Italian painter, born at Forlì. He was a pupil of Annino da Forlì, but was more influenced by Mantegna, and especially by Piero della Francesca, who was then at the height of his fame, and of whom he may once have been a pupil. Melozzo was introduced to the notice of Pope Sixtus IV., and became a favorite painter. For this Pope and his nephew, Cardinal Riario, he executed his two great frescoes, "An Audience of Sixtus IV.," for the Vatican Library, and an "Ascension," for the Church of the Santi Apostoli. The first of these has been transferred to canvas, and is in the Vatican Picture Gallery; the latter is in fragments, some of which are in the Quirinal. The angel musicians in the sacristy of Saint Peter's are among the most exquisite examples of early Italian art. The whole work shows that Melozzo understood foreshortening, a part of perspective then little studied. In 1480 he returned to Forlì, and not long afterwards entered the service of Federigo da Montefeltro at Urbino, and executed the "Personification of the Arts and the Sciences" for the ducal library. This fresco is also in fragments. Both Berlin and London possess portions of it. Many paintings are now doubtfully attributed to him. Consult Schmarzow, *Melozzo da Forlì* (Stuttgart, 1886).

FORM (Lat. *forma*, shape). In botany, the unit of ecology, as the species is the unit of classification or taxonomy. The term is often used in expressions such as 'life form,' 'plant form,' etc. See **ECOLOGY**; **TAXONOMY**.

FORM. In music, that element which unites all the various parts into an harmonious whole. It is essential that these various parts should have some intimate relation to one another, otherwise they could only be loosely strung together, and could never represent artistic unity. Musical unity is attained by various means, such as the repetition of musical motives or phrases, the maintaining of a certain rhythm or figuration, the choice of a fixed tonality. Dissonant or contrasting elements are not excluded, but they must be resolved into a higher unity. The germ of all musical form is the two-measure motive or *section*. A combination of two sections forms a *phrase*, of two phrases a *period*. The first two phrases constitute the *antecedent*, the last two the *consequent*. This is shown by the example (1) from Beethoven on the following page. To this period Beethoven adds another one (2) similarly constructed, and standing to the first in the relation of consequent to antecedent. These two periods together constitute what is known as the simple *Liedform*. Symmetry is one of the most essential features of all musical works, and a composition is unintelligible unless its themes are so arranged that the architectonic structure of the whole presents perfect symmetry. The three fundamental forms are the liedform, sonata-form, and rondo-form. The grouping of the themes in these forms is:

I. Liedform. A—B—A.

II. Sonata-form [:A (key of tonic); B (key of dominant):]— $\frac{A}{B}$ —A—B (in key of tonic).



III. Rondo-form (a) with two themes; A—B—A (in key of B); B (in key of A)—A; (b) with three themes A—B—A—C—A—B—A. The second and third time A appears in keys different from the original.

These forms admit of considerable variety, and the great masters, especially Beethoven, have been inexhaustible in ingenious combinations of themes. No definite rules can be laid down in this respect; anything is permissible that does not destroy the symmetry of the whole. In cyclical compositions symmetry between the various movements is maintained by the proportion of the various movements to one another, the relation of their keys, the alternation of slow and fast tempo, and sometimes also the introduction of a theme from a previous movement (Beethoven, Symphony No. 9). See CYCLICAL FORMS.

Instrumental forms were originally developed from simple vocal forms. Their development has been the slow product of centuries. Simple dances were united in the suite (q.v.), which gradually developed and evolved the sonata. From the stringing together of madrigals arose the original *dramma per musica*, which became the *opera* (q.v.) and culminated in the *musical drama* (q.v.). For a careful study of musical forms consult Lavignac, *Music and Musicians*, translated from the French by Marchant, with additions by Krehbiel (New York, 1898).

FORM. In philosophy, a term used by Plato (Gk. *ἵδεα*, *εἶδος*) to express the reality of a thing; that which makes it what it is, and which is permanent; in contrast with appearances and objects of sensation that pass away and are altered as they pass. The metaphysical character of Plato's forms, or ideas, has been the subject of much dispute, the question being whether Plato conceived them as having an existence in independence of the world of sense, or whether they were not for Plato very much what laws of nature are for the modern scientist. Aristotle gave the authority of his great name to the former interpretation, which has thus become traditional. Aristotle himself used the word *form* as expressing the essence of a thing, and this meaning became current in scholasticism especially in the expression 'essential form.' Bacon used the word *forms* in the sense of "the laws and modes of action which regulate and constitute any simple nature, such as heat, light, weight, in all kinds of matter susceptible of them; so that the form of heat and the law of heat, or the form of light and the law of light, are the same thing." But Bacon did not succeed in keeping it free from scholastic connotation, even in his own use of the word. Kant used the

term in the sense of a framework, supplied by the nature of the mind in its percipient character; within this framework the materials of sense are organized by the action of thought. Kant recognized two such forms, *space* and *time*. In this sense, form is subjective, i.e. it is not a characteristic belonging to an object as it is in its own intimate nature, but only as it appears in experience. Hegel pointed out the impossibility of thus separating the objective and the subjective, and used form in the sense of the total effect of a unity of distinctions.

FORMALDEHYDE, H.CHO. A compound of carbon, hydrogen, and oxygen—the simplest of the class of aldehydes (q.v.). It is obtained by the oxidation of wood alcohol. Dry air, saturated with the vapor of wood alcohol, is passed over a superficially oxidized spiral of copper gauze, inclosed in a long glass tube. The products of the reaction—the vapors of formaldehyde and water—pass out of the glass tube into empty receivers, in which the water vapor condenses to liquid water, and the latter dissolves much of the formaldehyde vapor, the result being a 35-per cent. solution of formaldehyde in water. Such formaldehyde as passes unabsorbed through these receivers is taken up in water, forming more—this time weaker—aqueous formaldehyde.

Attempts to condense formaldehyde vapor alone, without water, have invariably failed, the isolated compound undergoing chemical transformations with great rapidity. Formaldehyde solutions, known commercially under the name of *formalin*, are used as antiseptics and disinfectants, in the manufacture of certain dyes, etc. Subcutaneous injections of formalin have been proposed as a remedy for septicæmia, but the possible value of the drug is more than counterbalanced by its highly poisonous nature. In this connection it may be interesting to note that, while formaldehyde itself is poisonous, its compound with acid sodium sulphite, $\text{CH}_2(\text{OH})\text{SO}_3\text{Na}$, whose properties resemble to some extent those of formaldehyde itself, is harmless. With ammonia formaldehyde reacts to form a compound known as hexamethylene-amine, $(\text{CH}_2)_6\text{N}_4$. This reaction permits of determining analytically the amount of formaldehyde in a given solution.

Formaldehyde has formed the starting-point in the modern synthetic work on the sugars (q.v.). If allowed to stand for some time in the presence of weak alkalies, it is transformed into a mixture of simple sugars known as "formose" and including ordinary fructose ("levulose"). It is possible that in the transformation by plants of atmospheric carbonic acid into complex carbohydrates, such as the sugars and

starch, the production of formaldehyde is the first step. Formaldehyde itself has never been found in plants, and would probably kill them if produced in considerable quantities. Possibly every trace of formaldehyde undergoes chemical change as soon as formed. See FORMIC ACID.

FORM'ALIN. See FORMALDEHYDE.

FOR'MAN, HARRY BUXTON (1842—). An English author, born in London. He entered the civil service in 1860, and became assistant secretary in the general post-office and comptroller of packet services. Known for his essays and his editions of Shelley (1876-80) and Keats (1883), he has also published *The Letters of Keats to Fanny Browne* (1878); *The Shelley Library* (1886); *E. B. Browning and Her Scarcer Books* (1896); and *The Books of William Morris* (1897).

FORMAN, SIMON (1552-1611). A notorious English astrologer and quack doctor. He claimed to have discovered his marvelous powers in 1579, and thereafter practiced as a quack. Strangely enough, he received later (1603) the degree M.D. from Jesus College, Cambridge. At this time he was engaged in a most scandalous practice among the ladies at Court, with love philtres and wax images. Besides his *Grounds of the Longitude* (1591), he left behind him a mass of manuscripts, small parts of which have been published, as the *Diary* from 1564 to 1602 (J. O. Halliwell-Phillipps, 1843), and extracts from the *Book of Plays* (Halliwell-Phillipps, Folio Shakespeare, 1853-65), giving the dates of performances at the Globe Theatre of *Macbeth* (April 20, 1610) and *Winter's Tale* (May 15, 1611).

FORMA PAUPERIS, IN (Lat., in the character of a poor person). The phrase usually employed in both England and America when a person arranges to conduct an action in such a way as to avoid certain expenses because too poor to sue in the ordinary way. In England, the statutes 11 Hen. VII., c. 12, and 23 Hen. VIII., c. 15, provide that such as will swear themselves not worth £5 except their wearing apparel and the matter in question in the cause, shall be exempt when plaintiffs, but not when defendants, from the payment of court fees, and shall be entitled to have counsel and attorney assigned to them by the court without fee. They are further excused from costs when unsuccessful; a privilege which, according to Blackstone, amounted in former times only to the rather uncomfortable alternative of choosing between paying and being whipped. In the event of success, however, a person suing in this form is entitled to his costs, because his counsel and agent, and the officers of court, though they are bound to give their labor gratis to him, are not bound to give it on the same terms to his antagonist, unless he too be a pauper. To prevent the abuse of suing in the superior courts at Westminster in this form in matters of small amount, it is provided (19 and 20 Vict., c. 108, § 30), subject to certain exceptions, that any plaintiff who resorts to one of these, in a case falling within the cognizance of a county court, and recovers no more than £20, or in some cases £5, shall have no costs, unless he satisfies the court or a judge that he had sufficient reason for taking that course.

In Scotland this benevolent arrangement was introduced by statute more than half a century before the date of the English act above mentioned.

Similarly, actions *in forma pauperis* may be

prosecuted in all of the United States. The provision is deemed a part of the common law of the several States, derived from the English system of administering justice, though it is now in many States governed by statute.

FORMATION (Lat. *formatio*, from *formare*, to shape, from *forma*, shape). In botany, a widespread assemblage of plants with similar life relations, whose presence is determined by climatic factors—e.g. one may speak of desert formations, or tropical evergreen forest formations. A second use of the word applies to an assemblage of similar plant societies (see SOCIETY); e.g. all the peat-bog societies of a region taken as a whole make up the peat-bog formation of that region. The word formation is also used as the equivalent of society; in this case the formation first described would be called climatic, in contrast to the edaphic formation or plant society. See ECOLOGY; DISTRIBUTION OF PLANTS.

FORMATION. In geology, a group of strata united by some common characteristic, such as age, origin, or composition. It is loosely employed, and may be synonymous with any of the stratigraphic divisions—e.g. coal formation (Carboniferous system), Canadian formation (Canadian series), etc.

FORMA UR'BIS (Lat., shape of the city). A famous map of Rome engraved on marble and affixed to the outer wall of the Templum Sacre Urbis (now the Church of SS. Cosma e Damiano). The fragments were discovered under Pius IV., during excavations back of the church, but were carelessly kept, and some were again found in 1888, having been used to repair a garden wall. Other portions were found from 1867 to 1884, near the church, and all the fragments are now in the Capitoline Museum. The map represents the plan of the city as reconstructed under Severus and Caracalla, after the fire of Commodus, and replaced a previous map made under Vespasian and preserved in the Templum Sacre Urbis, facing the Forum Pacis.

FORMEDON. An ancient form of action, in the law of England, belonging to the class of real actions, whereby the heir in tail, or the reversioner or remainderman who had been ousted by a discontinuance, was entitled to vindicate his claim to the lands from which he had been ousted. By 21 James I., c. 16, it was enacted that writs of formedon should be brought within twenty years after the cause of action arose. The writ of formedon is now abolished.

FORMENTERA, fôr'mân-tâ'râ. One of the Balearic Islands, in the western part of the Mediterranean (Map: Spain, F 3). It is a part of the Spanish Province of Baleares. The island has an area of 35 square miles, and a population, in 1900, of 2295. Wheat is chiefly grown. Formentera was taken by Aragon in 1232.

FORMER AGE, THE. A poem by Chaucer, a metrical version of part of his translation of Boethius. It was discovered by Bradshaw, and published by Morris in 1866.

FORMES, fôr'mēs, KARL JOSEPH (1816-89). A German-American opera singer, born at Mülheim-on-the-Rhine. He had a remarkably sonorous bass voice and considerable dramatic talent, his début at Cologne (1841), as Sarastro, in the *Magic Flute*, at once establishing his fame.

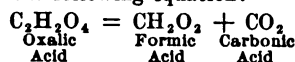
Other important European engagements were: Mannheim, 1843-48; Royal Italian Opera, London, 1852-57. Afterwards he visited the United States, where, with the exception of an occasional visit to Europe, he spent the remainder of his life. The parts of Falstaff in the *Merry Wives of Windsor*, and Plunkett in *Martha*, are said to have been written for him. He was enthusiastically received throughout the United States, and especially in New York. He died in San Francisco. His brother, THEODOR FORMES (1826-74), was trained as an operatic tenor, made a successful debut at Buda in 1846, and, after several important European engagements, during which he appeared successfully as Fra Diavolo, the Prophet, Robert, etc., made a tour of America with his elder brother. During this tour he temporarily lost his voice, and after recovering it fell a victim to insanity. He died in an asylum near Bonn. He was gifted with much dramatic fervor and intuition, and a voice of great volume and compass.

FORMIA, fôr'mě-ă (formerly Mola di Gaeta). A city in Southern Italy, on the north shore of the Gulf of Gaeta, 68 miles by winding rail northwest of Naples (Map: Italy, H 6). The lower slopes of the mountains that rise behind it are covered with groves of olives, lemons, oranges, and pomegranates. Noteworthy are the ruins of the so-called Villa of Cicero, or Villa Caposele, formerly the favorite residence of the kings of Naples, with ancient inscriptions and statues. From the upper terrace of the villa is a splendid view of the Gulf of Gaeta, the island of Ischia, and the promontories around the Bay of Naples. There is some coasting trade. Population, in 1881, of commune, 8600; in 1901, 8108.

FORMIC ACID (from Lat. *formica*, ant), CH_3O_2 . The simplest and one of the earliest known of the so-called fatty acids of organic chemistry. It derives its name from the circumstance of its having been first obtained from the *Formica rufa*, or red ant. In a concentrated state it is a fuming liquid with an irritating odor, and causes vesication if dropped upon the skin. If pure, it solidifies at moderately low temperatures, forming a crystalline mass that melts at 8.3°C . It boils at a slightly higher temperature than distilled water, yielding a vapor that burns with a blue flame. It is a powerful antiseptic, and acts chemically as a reducing agent; for instance, readily reducing the salts of silver, mercury, platinum, and gold. It may be obtained in various ways. For example: (1) By the distillation of red ants with water; (2) by the action of acids or alkalis upon hydrocyanic acid; (3) by the oxidation of various organic substances, such as sugar, starch, wood alcohol, etc.; (4) by the action of alkalis upon chloral or chloroform; (5) synthetically (Berthelot), by keeping carbonic-oxide gas for a prolonged period in contact with potassium hydroxide at a temperature of 100°C . Kolbe and Schmitt obtained it also by the reduction of carbonic acid—a reaction of great importance, as it suggests a possible explanation of the process by which the transformation of carbonic acid into complex organic substances is effected in the organism of plants; for, since formic acid itself is a very common product of the oxidation of organic bodies, it is easy to conceive how such bodies may be formed in plants by a reversed

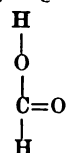
process—that is to say, by the reduction of formic acid, and hence of carbonic acid.

The most convenient method of preparing formic acid consists in gradually adding crystallized oxalic acid to anhydrous glycerin at a temperature slightly above 100°C ., oxalic acid decomposing into formic and carbonic acids according to the following equation:



In the animal organism formic acid occurs not infrequently, either free or in combination; thus, it is found not only in ants, but in the poison of the bee and wasp, and in the hairs of the procession caterpillar. It has also been detected in sweat, in the expressed juice of the spleen, pancreas, thymus gland, and muscles, in the brain, the blood, and the urine.

The salts of formic acid, called *formates*, or *formiates*, are crystalline substances, soluble in water, and, if heated above 400°C ., readily transformed into salts of oxalic acid. Chemically, formic acid is both an acid and an aldehyde, its molecule containing both the acid group COOH and the aldehyde group CHO :



Formic Acid

and it is to the presence of the latter group in its molecule that formic acid owes its reducing properties. See ALDEHYDES.

FORMICARIIDÆ (Neo-Lat. nom. pl., from *Formicarius*, from Lat. *formica*, ant). The ant family. See ANT; *Social Insects*, under INSECT.

FORMICATION (Lat. *formicatio*, from *formicare*, to crawl like an ant). A peculiar sensation of partial numbness and tingling of the skin, such as might be produced by the creeping of ants or other small insects over the surface. It is one of the forms of disordered tactile sensation, or paræsthesia, and resembles the awakening from numbness, or from a limb being 'asleep.' It is sometimes a symptom of spinal disease. It may be due to pressure on a nerve, or to poisoning by aconite; in the latter case the feeling is experienced in the tongue and cheeks.

FORMIGÉ, fôr'mě'zhă', JEAN CAMILLE (1845—). A French architect, born at Bouscat (Gironde). He studied architecture under J. C. Laisné, and prepared for the Government a series of plans and restorations of various public buildings, including the famous Roman Theatre at Orange. In 1885 he became architect of streets and parks at Paris. He constructed the buildings of Liberal Arts and Fine Arts at the Exposition of 1889, and of Rumania at that of 1900.

FORMOSA. A Territory of Argentina, South America, occupying the northeast portion of the Republic, and lying between the rivers Pilcomayo and Bermejo (Map: Argentina, E 8). It borders on Paraguay on the northeast and east, the Chaco Territory on the south and west, and the Province of Salta on the northwest. The area is estimated at 42,000 square miles. The surface is level, with an elevation of about 350 feet, the territory form-

ing a part of the great Chaco plain. Very little is known about the region. Its population was put in 1900 at 5589. The chief settlement is Formosa, on the Paraguay River, with about 1600 inhabitants. The town was founded after General Victorica defeated the natives of Chaco in 1884-85.

FORMOSA. A large and important island of the western Pacific, which formed part of the Empire of China until 1895, when it was ceded to Japan by the treaty concluded at Shimonoseki (q.v.). With the adjoining group of forty-seven islands known to foreigners as the Pescadores (q.v.), ceded by China to Japan by the same treaty, it forms a province of the Japanese Empire under the name of Taiwan.

TOPOGRAPHY. Formosa lies off the east coast of China, opposite the Province of Fu-kien, from which it is distant about 90 miles. It stretches in a general northeast to southwest direction from latitude $25^{\circ} 16'$ to $21^{\circ} 53' N.$, and extends east and west from longitude $120^{\circ} 15'$ to $122^{\circ} 5' E.$ Its length is about 235 miles, and its greatest breadth 90 miles; estimated area, 13,418 square miles. Its shape is that of a long oval running to a point known as South Cape. Forty miles east of this lies the island of Botel Tobago, and a little farther north the small island of Samasana. Formosa is regarded by some as a link in the chain of volcanic islands which form the eastern escarpment of a former Malayo-Chinese continent. Along the greater part of the west coast facing China the water is shallow, while on the east coast deep water is found at once.

Throughout almost the entire length of the island, but nearer the east coast than the west, runs a great chain of forest-clad mountains, with peaks ranging from 7000 to nearly 15,000 feet in height. The two highest are Mount Morrison, called Mu-kang Shang by the Chinese, 14,360 feet, and Mount Sylvia, 11,380 feet. East of this massive backbone the country is mountainous, abruptly terminating in a precipitous coast and a few small rocky islands. Some of the cliffs present a sheer descent of from 3000 to 6000 feet. To the west of this mountainous region lies a range of low, barren clay hills, and to the west of this is a broad alluvial plain stretching from north to south, intersected here and there with water-channels, terminating in sand-banks and long muddy spits, the whole coast presenting a remarkable contrast to the bold rocky face of the east. The land on the west side is regularly gaining on the sea, owing, no doubt, to the sediment brought down from the mountains by the water-courses, especially during the rainy season, when travel in some parts of the interior is rendered almost impossible.

CLIMATE. Except in the north, the climate during the winter is delightful. The excessive rainfall of the north, and especially in the neighborhood of Kelung, makes it unpleasantly cold, though the temperature is generally higher than in the same latitude on the mainland of China. At Tainan the atmosphere is said to be clear and bracing. On the whole, however, the climate is very trying to many. The temperature seldom rises to $100^{\circ} F.$, but the general humidity renders even a moderate degree of heat very enervating.

FAUNA. As Formosa is included within the 'Oriental' zoögeographical region, formed to in-

clude the Indo-Chinese coast and the Malayan and Chinese islands, the general characteristics of its fauna will be found under the title **ORIENTAL REGION.** The island has not been thoroughly explored by naturalists, though Swinhoe and others have done much investigating. Its denizens are largely the same as those of the adjacent mainland, showing that there formerly was a land connection. That the separation occurred comparatively long ago, however, is probable from the fact that the island possesses a goodly number of peculiar species, though very few, if any, are of a peculiar genus. The main departures have been in small forest-keeping birds and such small mammals as moles, flying squirrels, and mice, though a special species of goat-antelope or 'serow' (*Nemorhædus Swinhœi*) has been developed in the mountains, and one of a forest deer (*Cervus taëvanus*), allied to Chinese and Japanese species, which the natives have half domesticated. The tiger seems never to have reached Formosa, where the largest beast of prey is the beautiful 'clouded tiger' (*Felis macroscelis*).

MINING. The interior has been but little explored, and little is known of the geology of the island. Gold is found in the streams and is worked. Bituminous coal abounds in over two-thirds of the island. The best-known mines are situated near Kelung, and are worked under foreign superintendence. Sulphur is found in great abundance, especially in the north. Petroleum and natural gas are found, but are still undeveloped. Iron and silver are also reported.

AGRICULTURE AND INDUSTRIES. So far, agriculture is the chief industry of the island, and is carried on principally by the Chinese. The natural conditions are favorable to the development of that industry. Camphor, tea, and sugar are the staples of the island; but there are also produced rice, millet, corn, wheat, barley, yams, sweet potatoes, indigo, hemp, jute, peanuts, etc. The forests which cover the mountainous parts are rich in bamboo, camphor, banyan, betel-nut, and other trees. The camphor-tree, which is the most important asset of the island, as it gives to Japan a virtual control of the camphor-supply of the world, is found principally in the eastern part and in some parts of the interior. These regions are occupied chiefly by the wild tribes, and it is the policy of the Japanese Government to exploit the camphor forests without interfering with the inhabitants of the region. Since the monopolization of the camphor industry in 1899, steps have been taken for the elimination of the wasteful methods of production, which, under the old régime, had threatened the complete exhaustion of the camphor-supply of the island. Tea is grown chiefly in the northern part and sugar in the southern part of the island. The manufacturing industries are few, and confined principally to the production of sugar, camphor, mineral oil, etc.

COMMERCE AND TRANSPORTATION. Formosa has been open to foreign commerce since the Treaty of Tien-tsin (1858), which provided for the opening of the four ports of Tainan, Takow, Anping, and Tamsui. There are at present altogether thirteen ports in the island, of which those of Tamsui and Kelung get nearly three-fourths of the total commerce. The two safest harbors are those of Kelung, in the north, and Takow, in the southwest. The total value of merchandise

exported from the island in 1901 was about \$7,800,000, composed principally of tea, sugar, rice, camphor and camphor oil, hemp, jute, etc. The imports of merchandise for the same year amounted to nearly \$10,800,000, and consisted chiefly of fruit products, opium, textiles, metals and metal manufactures, lumber, saki, cigarettes and tobacco, etc. Over 50 per cent. of the total trade is with Japan, whose imports from the island have doubled during the period of 1899-1901; next comes China, with about one-third of the total, and Great Britain and the United States, with about \$1,000,000 each. The trade is carried on principally by a Chinese and a few European firms, while the commercial influence of Japan is confined to the trade in camphor, opium, and salt—all Government monopolies. The total shipping amounted in 1900 to about 210,000 tons, mostly in British and Chinese bottoms. The island has only one bank, the Bank of Formosa, a private corporation under Government supervision, with a capital of about \$2,500,000, and the right of issuing notes, whose circulation, however, is confined to the island. The construction of means of transportation and communication is being pushed by the Japanese Government with great rapidity. A trunk line, from Takow in the southwestern part of the island to Kelung in the north, has been more than half completed. In 1900 the two lines connecting Kelung with Sin-chu or Tek-cham (60 miles), and the line from Takow to Tainan (26 miles), were open for traffic.

GOVERNMENT AND FINANCE. The island is under the administration of a military Governor-General, who is responsible to the Cabinet at Tokio. He is assisted by a council. The civil Governor, who resides at Tai-pei, is responsible for the civil administration. Formosa and the Pescadores are divided, for administrative purposes, into seven districts, of which three are known as *kens*, or prefectures of first rank, and the other four as *chos*, or prefectures of the second class. The judicial code of the island is different from that of Japan. The finances are still in an unsatisfactory condition, owing to the unsettled state of the island, which necessitates the maintenance of a large military force. The budget of the colony for 1900-01 balanced at about \$11,000,000, and the subvention from the mother country was estimated in that year at about \$4,500,000. The revenue is derived chiefly from monopolies. Japanese schools are being established all over the island. In 1902 there were over 16,000 native pupils in Japanese schools.

POPULATION. According to the census of 1897 the population of the whole province numbered 2,797,543 persons, of whom 52,405 were in the Pescadores; 16,321 were Japanese. In December, 1898, the figures were 2,729,503, exclusive of resident Japanese and the aborigines.

ETHNOLOGY. The population consists of three elements: (1) The Japanese, who, apart from the garrisons, are mostly officials, teachers, traders, and fishermen; (2) the aboriginal tribes and clans; and (3) the Chinese settlers, chiefly from the provinces of Fu-kien and Kwang-tung on the mainland. These occupy the plain which borders the west coast, and the regions of the north. The Hakkas (q.v.) form an important feature of this part of the population. They live in villages of their own, and carry on the

greater portion of the barter trade with the aborigines. Until comparatively recent times no official was allowed within their inclosures.

So little is known regarding the aboriginal inhabitants of Formosa that the question of their relationship is very obscure. When the early Chinese settlers arrived in Formosa, some time after the year 1430, they approached it by the west coast, where they found many tribes of savages. Those first encountered they designated *Pepohwan*, 'Barbarians of the level plain.' These were gradually dispossessed and driven eastward to the low hills which flank the mountains on the west. They have acquired a certain amount of civilization, and speak Chinese. The males for the most part dress like the Chinese, and in religious matters follow the Chinese, though they still retain many of their original notions and practices. Inheritance is through the mother. By the Chinese they are now designated *Sek-huan*, 'cooked' or 'tamed barbarians,' as distinguished from the *Chi-huan*, 'raw' or 'untamed barbarians,' whose habitat is in the mountains beyond, and in the south. These are divided into many tribes and clans, with a great variety of languages and dialects, and preserve in their wild independence their ancient customs and institutions—bodily ornaments and mutilations, tattooing, head-hunting, spirit and nature worship, etc. They live in villages, have houses of stone roofed with great slabs of slate, and are remarkably neat and clean. Those living on the hill-sides build houses of bamboo, grass, and mud. Order prevails everywhere, and in marriage matters they are very strict. Often a large house is provided outside the village where the unmarried men sleep. They cultivate millet and other crops.

HISTORY. Chinese records speak of an expedition against Formosa undertaken as early as the year 603. Japanese adventurers are said to have landed and made conquests in it in the twelfth century, and we are told that from the fifteenth century the eastern or aboriginal half was officially considered by the Japanese as a part of their empire. The first Europeans to visit the island were Portuguese. This was in 1590. The Spanish attempted to hold a part of the island, but were driven out by the Dutch, who had gained a footing in the Pescadores in 1621. In 1624 the Dutch occupied a point near Taiwan, where they built a fort and a town which they called *Zeelandia*, began commercial operations on a great scale, opened schools, and inaugurated mission work. When in 1620 the persecution of native Christians broke out in Japan, large numbers of them fled to Formosa and formed a colony, but later dwelt with the Dutch until the latter were forced in 1662 to withdraw, as the result of many conflicts with the Chinese settlers, and with Koxinga (q.v.), the famous pirate, who succeeded in making himself King of the island. After a brief and stormy reign his successor was dethroned by the Manchu Emperors. The opening in 1858 of Formosa to foreigners was an important event in the history of the island. Roman Catholic missions were established in 1859. Protestant missions in 1860, and by 1864 a prosperous foreign trade had been established. The aborigines, however, continued to give trouble. As the result of the murder of a number of Japanese sailors by the natives, China was appealed to for redress, but disclaimed re-

sponsibility for the acts of the savages. In 1874 the Mikado sent a punitive expedition under General Saigo. On the protest of the Peking Government, however, the Japanese retired, but only on conditions secured in Peking by the Japanese envoy—Soyeshima (q.v.)—that China should reclaim and govern eastern Formosa, and pay the expense incurred by Japan. In 1884 Kelung was taken by the French under Admiral Courbet and held until June, 1885.

One result of the Chino-Japanese war over Korea, in 1894-95, as specified in the Treaty of Shimonoseki (q.v.), was the cession of Formosa to the Mikado's officers, June 2, 1895. The Chinese officials on the island, summoning the Black Flag General, Liu, to their aid, declared a 'republic.' Forthwith the Japanese Imperial guard of 7000 men was dispatched, the rebellious republic was duly crushed, and the natives were chastised. Then began the costly occupation and development. Outbreaks have been frequent, but order is being rapidly evolved from the complicated conditions of races and interests.

BIBLIOGRAPHY. This is extensive, but it may be simplified by consulting Henri Cordier's *Bibliographie des ouvrages relatifs à l'île Formose* (Chartres, 1803). The works of the early annalists contain much that is both useful and curious. See Imbault-Huart, *L'île Formose* (Paris, 1893). For those who can read French, this is an excellent work to refer to. Other general works on Formosa are: Campbell, *Missionary Success in Formosa* (London, 1889); Mackay, *From Far Formosa: the Island, Its People and Missions* (New York, 1896); *Geschichte Formosa bis Anfang 1898* (Bonn, 1898); Swinhoe, *Notes on the Island of Formosa* (1863). Mr. Swinhoe was a naturalist. Le Gendre, "Account of a Visit to the Southern Tribes," in *United States Commercial Relations for 1868-69*; House, *The Japanese Expedition to Formosa* (Tokio, 1875). The astonishing literary imposture may also be consulted: Balmanazar, *Description of Formosa* (London, 1705). Davidson, *The Island of Formosa* (1902), is the most recent work on the subject.

FORMOSAN DEER. A species of deer (*Cervus taëvanus*) peculiar to the mountains of Formosa, and frequently caught in traps by the people and tamed as a pet. It is one of the 'sika' group, which includes the spotted deer of Japan and others of Manchuria. It is lighter in color than the others, while the spots have a tendency to persist during winter; and the tail is white with a black stripe down the middle of its upper side. See Sika.

FORMOSUS. Pope, 891-896. He was born about 816, probably in Rome, and first appears in history as Cardinal Bishop of Porto (864); he was sent on an embassy to the Bulgarians by Nicholas I. in 866, and trusted with important missions by Adrian II. Having sided with the German faction against John VIII., he was excommunicated and banished; but on taking an oath never to return to Rome, or again to assume his episcopal functions, he was readmitted as a layman to the rites of the Church (878). From this oath he was absolved by Marinus, the successor of John VIII., and restored to his dignities (883); and on the death of Stephen VI., in 891, he was chosen Pope. The Italian faction had chosen Sergius; and the election of Formosus, which was in opposition to an old rule

against the translation of bishops from one see to another, could not be confirmed without violence, but he was rendered secure for a time by the success of the arms of Arnulf of Germany. After the withdrawal of Arnulf, Formosus was compelled to grant the Imperial crown to Lambert, son of Guido of Spoleto; but this act did not pacify the Italian faction, and Formosus was released from very hard straits only by the arrival of Arnulf, who captured Rome in the end of 895. In the following year Arnulf was crowned Emperor by Formosus, who died soon after. His successor, Stephen VII., had his body disinterred and treated with contumely as that of a usurper of the Papal throne; but Theodorus II., in 897, restored it to Christian burial, and at a synod presided over by John IX., in 898, the pontificate of Formosus was declared valid and all his acts confirmed.

FORMS, or QUANTICS. In mathematics, rational, algebraic, integral, homogeneous functions of r variables, $x_1, x_2, x_3, \dots, x_r$, the degree of these variables being the order of the form. If $r=2$ there results a binary form; if $r=3$, a ternary, etc., terms due to Gauss (1801). Symbolically, a binary form may conveniently be represented by $f(x_1, x_2) = \sum_{r=0}^n \binom{n}{r} a_r x_1^{n-r} x_2^r$. With

algebraic forms is connected the study of invariants and covariants, the whole subject being sometimes called, by the English, the theory of quantics, or modern higher algebra. The theory was first extensively investigated by Gauss (q.v.), although Lagrange had already studied the invariant property of the discriminant (Sylvester, 1852; Gauss had called it the determinant, 1801) $a_0 a_2 = a_1^2$, of the quadratic form $a_0 x^2 + 2a_1 xy + a_2 y^2$, finding, namely, that it is unaltered by substituting $x + \lambda y$ for x . To Boole (1841) is due the discovery of the invariant property of the discriminant of every binary form. Eisenstein, Hesse, Aronhold, and Clebsch in Germany, Cayley and Sylvester in England, and Briochi in Italy, have been among the most prolific contributors to the theory. The best historic survey is that of Franz Meyer, "Bericht über den gegenwärtigen Stand der Invariantentheorie," in *Jahresbericht der deutschen Mathematiker-Vereinigung*, vol. i. (Berlin, 1892). The most important treatises upon the subject are: Cayley's "Memoirs upon Quantics," in the *Philosophical Transactions* (London, 1854 et seq.); Salmon, *Modern Higher Algebra* (Dublin, 1859, and enlarged later editions); Fiedler, *Die Elemente der neueren Geometrie unter der Algebra der binären Formen* (Leipzig, 1862); Clebsch, *Binäre Formen* (Leipzig, 1872); Faà di Bruno, *Formes binaires* (Turin, 1876; Leipzig, 1881); Gordan, *Invariantentheorie* (Leipzig, 1887); Elliot, *Algebra of Quantics* (Oxford, 1895). The most recent digest of the theory, with bibliography and historical notes, is Meyer, "Invariantentheorie," in the *Encyklopädie der mathematischen Wissenschaften*, vol. i. (Leipzig, 1899).

FORMS OF ACTION. The approved classes into which actions are divided under the common-law system of pleading and practice. They had their origin in the use of original writs, which were mandatory letters or processes issuing in the King's name, containing a statement of the alleged injury, and directing the sheriff to first command the defendant to satisfy the claim, and,

on his failure to do so, to summon him into court to answer and defend the complaint made against him. Many of these writs were of remote antiquity, some of them antedating the Conquest, and others being shaped by the clerks and judicial officers of the Norman kings. They were drafted in fixed and certain forms, providing remedies for the more ordinary and obvious civil wrongs. These writs were limited in number; and where an injured person could not make the facts of his case fit the allegations of a known writ, he was wholly without remedy, as there was no other way in which he could get his cause before the court. Thus they had the effect of limiting and defining the right of action itself, and for this reason the enumeration of writs and causes of action became identical. This condition of affairs was somewhat relieved by the introduction of curious and arbitrary legal fictions, whereby an old writ was made to do service for a new cause of action. Thus, there being no form of action for the recovery of goods unlawfully detained by a tort-feasor, the action in trover, originally devised to permit the recovery of lost goods from the finder, was without change of form made available for the more general purpose. For example, if A, having B's goods in his possession, wrongfully withheld them from B, the writ would allege that B had casually lost the goods and A had found them, but, although knowing them to be the goods of B, had refused to deliver them to him. B was not required to prove this fiction, but could show the true circumstances, which might be that he had given A the goods to store for him, to be

returned on demand, and that A had converted them to his own use.

A further important modification of the ancient forms of action was effected by a statute enacted in the reign of Edward I., which provided that where the facts of a new case were similar to those covered by a known writ, the clerks of Chancery should have power to frame a new writ to meet the exigencies of the case. This caused an increase in the number of writs, and consequently in forms of action, the new forms being known as actions on the case, i.e. actions in similar cases (*in consimili casu*), and contributed very greatly to making the common-law system more efficient in the administration of justice. Notwithstanding these changes, forms of action have always remained inflexible and insufficient for the relief of many civil wrongs, and this inflexibility has been a potent cause of the growth of equity jurisdiction.

The following were the principal forms of action at common law: Assumpsit, Covenant, Debt, Account, Trespass, Trover, Case, Detinue, Replevin, Ejectment, and Writ of Entry. They have been abolished in England by the Judicature Acts (q.v.), and in several of the United States have been superseded by modern forms of action instituted by codes of procedure; but they are still in use with some changes and modifications in some jurisdictions. See ACTION; COMMON COUNTS; COMMON FORMS; PLEADING; PRACTICE.

FORMS OF ADDRESS. In those countries where gradations of rank and title prevail there is great complexity in the forms of address. As

PERSONAGE	Address of Letter to	Beginning of Letter to and reference to
Archbishop.....	His Grace the Lord Archbishop of —.....	My Lord Archbishop; your Grace.
Baron.....	The Right Hon. Lord —.....	My Lord; your Lordship.
Baron's son.....	The Hon. John —.....	Sir.
Baron's daughter.....	The Hon. Mary —.....	Madam.
	(If married, the Hon. Mrs. —)	
Baronet.....	Sir John —, Bart.....	Sir.
Baronet's wife.....	Lady —.....	Madam.
Bishop.....	The Right Rev. the Lord Bishop of —; or simply, The Lord Bishop of —.....	My Lord; your Lordship.
Countess.....	The Right Hon. the Countess of —.....	Madam; your Ladyship.
Daughter of Duke, Marquis, Earl.....	The Lady Mary —.....	Madam; your Ladyship.
Duchess.....	Her Grace the Duchess of —.....	Madam; your Grace.
Duke.....	His Grace the Duke of —.....	My Lord Duke; your Grace.
Earl.....	The Right Hon. the Earl of —.....	My Lord; your Lordship.
Eldest son of Duke, Marquis, Earl.....	Uses the second title of his family, and is by courtesy addressed as though he held the title by law.	
King.....	His [Most Gracious] Majesty the King.....	Sire; your Majesty.
Knight.....	Sir John —.....	Sir.
	(If a knight commander of any order, its initials follow name, as K.C.B., K.C.S.I.)..	
Knight's wife.....	Like baronet's wife.	
Lord Lieutenant (of Ireland).....	His Excellency the Lord Lieutenant.....	According to rank.
Lord Mayor*.....	The Right Hon. the Lord Mayor.....	My Lord; your Lordship.
Maid of Honor.....	The Hon. Mary S —.....	Madam.
Marchioness.....	The Most Hon. the Marchioness of —.....	Madam; your Ladyship.
Marquis.....	The Most Hon. the Marquis of —.....	My Lord; your Lordship.
Members of Parliament.....	The letters M.P. are added to their usual address.	
Officers in the Army and Navy.....	Their rank in the service, if above subaltern, is prefixed to any other rank.	
Prince.....	His Royal Highness the Prince of —, or Prince —; or (if the prince is a duke) His Royal Highness the Duke of —.....	Sir; your Royal Highness.
Princess.....	Her Royal Highness the Princess of —, or the Princess —, or the Duchess of —.....	Madam; your Royal Highness.
Privy Councillor.....	The Right Hon. —.....	Madam; your Majesty.
Queen.....	Her Majesty the Queen.....	My Lord; your Lordship.
Viscount.....	The Right Hon. Viscount —.....	Madam; your Ladyship.
Viscountess.....	The Right Hon. Viscountess —.....	My Lord; your Lordship.
Youngest son of Duke or Marquis.....	The Lord John —.....	Sir.
Youngest son of Earl or Viscount.....	The Hon. —.....	

* The title 'Lord Mayor' is confined to the chief magistrate of London and a few of the larger cities—until recently York and Dublin alone.

those which are most often practically useful, the ceremonious modes of addressing letters to titled personages in England are given above. It must be understood that in nearly all cases these forms are employed only where strict formality is requisite, as from complete or comparative strangers. In informal conversation it is nowhere the custom of persons of good social position to use the strict forms here given unless there are personal or professional reasons for it. Thus, for example, a very young man of good manners, speaking to an aged and distinguished peer, or a clergyman to his bishop, may call him 'My Lord'; but the King or the Prince of Wales is usually addressed by persons with whom he is acquainted simply as 'Sir,' the Queen as 'Ma'am,' a duke as 'Duke,' other peers and their wives as 'Lord ——' and 'Lady ——.'

Forms of address in the United States are not so rigidly governed by custom as in the older or monarchical countries, but it is well to know that common usage has sanctioned the following forms:

The President of the United States, Governors of States, and ambassadors and ministers to foreign countries are addressed as 'His Excellency' (the President of the United States, etc.).

The Vice-President, heads of executive departments at Washington, Justices of Supreme or Superior Courts, Lieutenant-Governors of States, Mayors of cities, etc., 'The Hon. ——' (Vice-President of the United States, etc.).

Senators and Representatives of the United States, or of the several States, 'The Hon. ——,' to which may be added their official designation.

Ex-Presidents or other former officials of the above-mentioned ranks are commonly addressed as 'The Hon. ——.'

Archbishops: 'The Most Rev. the Archbishop of ——.' (If a cardinal, 'His Eminence the Cardinal Archbishop of ——'.)

Bishops in the Roman Catholic or Episcopal Churches: 'The Right Rev. the Bishop of ——,' or 'The Right Rev. ——.' In the Methodist Church, 'The Rev. Bishop. ——.'

The use of the term 'Esquire' was at one time largely confined in America to addressing lawyers; but of late years the English practice which attributes it to any gentleman of position not possessing another title has been gaining ground, although 'Mr. ——' is still a common usage.

FORMULA, CHEMICAL. See CHEMISTRY.

FORMULA OF CONCORD. See CONCORD, BOOK OF.

FORNARINA, fôr'nâ-rê'nâ, LA. See RAPHAEL; SEBASTIANO DEL PIOMBO.

FORNEY, JOHN WEISS (1817-81). An American journalist and politician. He was born at Lancaster, Pa., and at the age of sixteen entered the printing-office of the Lancaster *Journal*. Four years later he purchased the Lancaster *Intelligencer*, and in 1840 he became proprietor of the *Journal*, and combined the two papers under the name of the *Intelligencer and Journal*. In 1845 his appointment by President Polk as deputy surveyor of the port of Philadelphia took him to that city, where he purchased a half interest in the *Pennsylvanian*, a Democratic paper of great influence, which under his editorial control attained a national importance. In 1851 he was chosen clerk of the

United States House of Representatives, serving until 1855. During his service at Washington he edited the *Union*, the organ of the Northern Democrats. In 1855 he headed the Pennsylvania delegation to the National Convention at Cincinnati, and was largely instrumental in securing the nomination of Pennsylvania's candidate, Buchanan. In August, 1857, he established the *Philadelphia Press*. Though at first a Douglas Democrat, Forney became, in the latter days of the Buchanan Administration, a pronounced Republican, and contributed largely to the organization of that party and its early successes. Elected a second time clerk of the National House of Representatives in 1859, he removed to Washington, and began the publication of the *Sunday Morning Chronicle*, which in 1862 was changed to a daily, and was throughout the Civil War looked upon as the particular organ of the Lincoln Administration. After serving as secretary of the United States Senate from 1861 to 1868, he disposed of his interest in the *Chronicle* and returned to Philadelphia, where in 1871 he was made Collector of the Port by President Grant. He was an earnest promoter of the Centennial Exposition, and visited Europe in its interest in 1875. In 1877 he sold the *Press* and established a weekly, the *Progress*, which he edited until his death. In 1880 he left the Republican Party and supported Hancock for the Presidency. He published *Letters from Europe* (1869); *What I Saw in Texas* (1872); *Anecdotes of Public Men* (2 vols. 1873); *Forty Years of American Journalism* (1877); *Life of Winfield Scott Hancock* (1880); and *The New Nobility* (1882).

FORNICATION (*fornicatio*, from *fornix*, an arch-vault, and by metonymy a brothel, because brothels in Rome were in cellars and vaults under ground). The illicit carnal intercourse by an unmarried person with one of the opposite sex, whether married or unmarried. In most countries this offense has been brought within the pale of positive law at some period of their history, and prohibited by the imposition of penalties more or less severe; but it is now usually left to the restraints which public opinion imposes on it in every community which is guided by the principles of morality and religion. In England, in 1650, during the ascendancy of the Puritan party, the repeated act of keeping a brothel, or committing fornication, was made felony without benefit of clergy on a second conviction. At the Restoration this enactment was not renewed; and though notorious and open lewdness, when carried to the extent of exciting public scandal, continued, as it had been before, an indictable offense at common law, the mere act of fornication itself was abandoned 'to the feeble coercion of the spiritual court.' In a few of the United States the offense is made a misdemeanor by statute, punishable by fine and imprisonment, but in most of the States the common-law rule prevails. Consult the authorities referred to under CRIMINAL LAW.

FORREST, EDWIN (1806-72). An American tragedian, long the most famous that our stage had produced. He was born in Philadelphia, March 9, 1806, of Scottish and German descent. Already he had attracted attention in amateur theatricals when, November 27, 1820, he made his first regular appearance at the Walnut Street

Theatre, in Philadelphia, in Home's *Douglas*. By diligence and close study he rose in the profession, and in 1826, at the Park Theatre, New York, made a decided triumph in *Othello*. Thenceforward his career was one of distinction, both in this country and in England, where he made his first appearance at Drury Lane in *The Gladiator* in 1836. There in 1837 he married Catharine, the daughter of John Sinclair, the singer. In later years he became jealous of her, and the trial by which, in 1852, he obtained a divorce was one of the most celebrated cases of the time. His quarrel with Macready was another affair which did him little honor. Much of the odium that has been cast upon him for the Astor Place Riot in New York (1849), which was ostensibly in favor of Forrest against his English rival, was certainly undeserved; for that unfortunate outbreak was really one of the episodes of the native American movement of the period; but Forrest's relation to the matter was far from dignified. Though he lost the favor of many of the best people, his success upon the stage was, nevertheless, uninterrupted. He had already made a fortune, and built a castle upon the Hudson, called 'Fonthill'; later he established himself in a home in Philadelphia. His last professional appearance was in 1871. He died December 12, 1872, from apoplexy, after an illness of half an hour, and in his will left a large portion of his ample estate to found a home for aged and destitute players.

Forrest has been called essentially a melodramatic actor. His robust physique and voice made the assumption of sentimental parts almost impossible. In Shakespeare his best rôles were Richard III., Lear, Coriolanus, and Othello, but he was even more effective in Virginius, Metamora, Spartacus, Damon, and characters of that range. His personal disposition was impetuous and frank, though marred at times by jealousy and an excessive opinion of his own merits. His scholarship in the line of his profession was good, and he gathered a splendid library, in which the Shakespearean collection was famous. Consult: Barrett, *Edwin Forrest* (Boston, 1882); Alger, *Life of Edwin Forrest, the American Tragedian* (Philadelphia, 1877); Rees, *The Life of Edwin Forrest, with Reminiscences and Personal Recollections* (Philadelphia, 1874).

FORREST, FRENCH (1796-1866). An American naval officer, born in Maryland. He distinguished himself as a midshipman in the War of 1812, and was present at the battle of Lake Erie. In 1817 he became a lieutenant, in 1837 was promoted to be commander, and in 1844 to be captain. During the Mexican War he served as adjutant-general of the naval and land forces. He joined the Confederate side at the outbreak of the Civil War, was appointed to the command of the navy yard at Norfolk, and subsequently became Acting Assistant Secretary of the Confederate Navy.

FORREST, Sir JOHN (1847—). An Australian explorer and politician, born in Western Australia. He entered the survey department of that colony in 1866, in 1869 commanded an expedition to the interior in search of Dr. Leichardt, and in 1870 led an exploring expedition from Perth to Adelaide. In 1874 he commanded a second exploring expedition, from Champion Bay on the west coast to the overland telegraph

line between Port Darwin and Adelaide, a distance of about 2000 miles. He was appointed Deputy Surveyor-General of Western Australia in 1876, and Commissioner of Crown Lands and Surveyor-General in 1883. From 1890 to 1901 he served as first Premier and Treasurer of Western Australia under a responsible form of government. He was also Postmaster-General of Australia in 1900-01, and in 1897 was elected President of the Federal Council of Australia. In 1901 he became Minister of State for Defense for the Commonwealth of Australia. The gold medal of the Royal Geographical Society of London was awarded to him in 1876. His publications include: *Explorations in Australia* (1876), and *Notes on Western Australia* (1884-87).

FORREST, NATHAN BEDFORD (1821-77). An American soldier, distinguished as a cavalry leader on the Confederate side during the Civil War. He was born near the site of Chapel Hill, Tenn., on July 31, 1821; removed with his father, a blacksmith, to Tippah County, Miss., in 1834; attended school for only about six months altogether; joined an uncle in the horse and cattle trading business at Hernando, Miss., in 1842; later became a slave-trader at Memphis, Tenn., and by 1859 had accumulated a considerable fortune. Though at first opposed to a dissolution of the Union, he entered the Confederate Army as a private in June, 1861, soon after the outbreak of the Civil War, and in July was called upon by Governor Harris of Tennessee to organize a battalion of cavalry, of which, in October, he became lieutenant-colonel. Soon afterwards he was ordered to Fort Donelson, where he remained until Grant's attack, and with Floyd escaped on the night of February 15-16, 1862, leaving Buckner to surrender on the 17th. (See FORT HENRY AND FORT DONELSON.) On July 21, 1862, he was promoted to be brigadier-general, and thereafter served in Kentucky for some time under General Bragg. He was transferred to northern Mississippi in November, 1863, was promoted to be major-general on December 4th of that year, and in November of the following year was placed in command of all the cavalry with the Army of Tennessee. On January 24, 1865, he was placed in command of the cavalry in Alabama, Mississippi, and east Louisiana; on February 28th became a lieutenant-general; in March was defeated at Selma, Ala., by Gen. J. H. Wilson; and in May surrendered at Gainesville, his troops being included in the arrangement made by Gen. Richard Taylor with General Canby. In the North he became unfavorably known as the leader of the Confederates at the so-called 'massacre of Fort Pillow,' though he uniformly denied the charges that were brought against him. (See FORT PILLOW.) After the war he worked his plantation for a time, was president from 1868 to 1874 of a company which endeavored without success to build a railroad between Memphis and Selma, and subsequently until his death conducted two large plantations, one on President's Island and the other in Shelby County, Tenn. During part of the Reconstruction period he is said to have been at the head of the Ku-Klux Klan (q.v.). Consult: Jordan and Pryor, *Campaigns of Nathan B. Forrest* (New York, 1868); Wyeth, *Life of General Nathan Bedford Forrest* (New York, 1899); and Mathes, *General*

Forrest (New York, 1902), one of the "Great Commanders Series."

FORREST CITY. The county-seat of Saint Francis County, Ark., 90 miles east by north of Little Rock; on the Saint Louis, Iron Mountain and Southern and the Choctaw, Oklahoma and Gulf railroads (Map: Arkansas, E 2). It is the centre of a fertile agricultural and stock-raising district, and has manufactures of spokes, cottonseed oil, etc. Population, in 1890, 1021; in 1900, 1361.

FORRESTER, ALFRED HENRY (1804-72). An English artist, whose pen-name was **ALFRED CROWQUILL**. Born in London, he was educated at a private school in Islington, and became associated in business with his elder brother, a notary, but retired in 1839. At the age of twenty he began to contribute to various periodicals, and afterwards practiced drawing and modeling, wood and steel engraving. He contributed sketches to *Punch*, the *Illustrated London News*, other periodicals, and several annuals; exhibited pen-and-ink sketches at the Royal Academy (1845-46), and illustrated many books, six of which he wrote himself. *Phantasmagoria of Fun* (1843) is representative of his best work, and some of his other publications are: *A Bundle of Crowquills* (1854); *The Comic Arithmetic* (1844); *The Book of Ballads* (1849, with Doyle and Leech). His elder brother, **CHARLES ROBERT** (1803-50), also employed the name of Alfred Crowquill. Charles was for a time on the staff of the *New Monthly Magazine* and *Bentley's Miscellany*. He was the author of several novels and tales.

FORRESTER, FANNY. The pseudonym of Miss Emily Chubbuck, who became the wife of Adoniram Judson, the American missionary. See **JUDSON, ADONIRAM**.

FORSBERG, förs'ber-y', NIELS (1841—). A Swedish painter, born at Riseberga, Skåne. The son of a peasant, he spent his early years in farming, then was apprenticed to a house-painter at Göteborg. Dabbling in sculpture, he fashioned a statue of Minerva good enough to procure for him a Government stipend which enabled him to go to Paris in 1867. There his true vocation was discovered to be for painting, and he became the pupil of Bonnat. The siege of Paris, during which he enlisted in the Ambulance Department, afforded him many opportunities for studying and sketching the stirring scenes that came under his observation. In 1878 he exhibited "An Acrobat Family," now in the Museum at Göteborg, but his finest production, "The Hero's Death" (1888), for which he was awarded the great gold medal, is in the National Museum at Stockholm. Afterwards he devoted himself more especially to historical subjects.

FORSETE, för-sët'e, or FORSETI, för-sët'e (Icel., Fore-seated). The son of Balder, and the god of Justice, in Norse mythology.

FORSHEY, CALEB GOLDSMITH (1812-81). An American engineer, born in Somerset County, Pa. He was educated at Kenyon College, Ohio, and at West Point, but left the latter institution in 1836 before graduating, and became professor of mathematics and civil engineering at Jefferson College, Miss. He was engaged in engineering work in the Southwestern States for several years, was engineer in charge of the Government survey of the Mississippi River delta from 1851

to 1853, and from 1853 to 1855 was chief engineer of the Galveston, Houston and Henderson Railroad. From 1855 to 1861 he was principal of the Texas Military Institute. On the outbreak of the Civil War he joined Sam Houston in actively opposing the secession movement in Texas in public meetings and in conventions. After the secession of the State, however, he offered his services to the Confederacy, and was commissioned a lieutenant-colonel of engineers, in which capacity he performed valuable services both in Virginia, where he served on the staff of General Magruder, and in Texas. After the war he engaged in railway engineering and in work on the Mississippi River and its branches. He was one of the authors of *The Physics of the Mississippi River* (1861).

FORSKÅL, för'skål, PETER (1732-63). A Swedish botanist. He was born at Helsingfors, studied at Göttingen, and was professor at Copenhagen. In 1761 he took part in a scientific expedition to Egypt and Yemen, where he collected several hundred plants which had previously been unknown. Seized with an attack of the plague, he died on his journey in Arabia. Among his publications are: *Dubia de Principiis Philosophiæ Recentioris* (1756); *Descriptiones Animalium, Avium, Amphibiorum, Piscium, Insectorum, Vermium, quæ in Itinere Orientali Observavit Petrus Forskal* (1775); and *Flora Egyptiaco-Arabica* (1775). The genus *Forskalia* is named in his honor.

FORSSELL, förs'sël, HANS LUDWIG (1843-1901). A Swedish historian and statesman, born at Gefle. He was educated at the University of Upsala, where he became a lecturer in 1866. In 1875-80 he was Finance Minister in the Council of State, and from 1888 president of the Exchequer. From 1879 to 1897 he was a member of the Upper House of the Riksdag. He largely assisted in the establishment of the gold standard for Swedish currency, and wrote *Studier och Kritiker* (1875-88), collections of essays; *Sveriges inre historia från Gustaf I.* (1869-75); and *Anteckningar ur Sveriges jordbruksnäring i 16 seklet* (1884).

FORST, först. A town in Brandenburg, Prussia, on the Neisse, 44 miles south of Frankfort-on-the-Oder (Map: Prussia, F 3). It has tanneries, and manufactories of woolen cloth and buckskin. Forst was founded in the thirteenth century. It has belonged to Prussia since 1815. Population, in 1890, 23,500; in 1900, 32,075.

FÖRSTEMANN, fër'ste-mån, ERNST WILHELM (1822—). A German philologist, born in Danzig. In 1865 he became chief librarian at the Royal Library in Dresden. His services in behalf of the reorganization of the Dresden Library were most important. His principal publications include: *Altdeutsches Namenbuch* (2 vols.; 2d ed. vol. i., 1900; 2d ed. vol. ii., 1872), a valuable and interesting work devoted to a discussion of old German proper names, the volumes being respectively devoted to names of persons and places; *Geschichte des deutschen Sprachstamms* (1874-75), his most important work; *Aus dem alten Danzig, 1820-40* (1900); and an edition of, as well as several interesting treatises on, the famous Maya manuscript in the Dresden library.

FÖRSTER, fër'stër, AUGUST (1822-65). A German anatomist, born at Weimar. He was

educated at Jena, and subsequently held professorships at Göttingen (1852-56) and Würzburg (1856-65), where his investigations on pathological histology and teratology gave him a wide celebrity. His chief publications include: *Lehrbuch der pathologischen Anatomie* (10th ed. 1875); *Atlas der mikroskopischen pathologischen Anatomie* (1854-59); *Grundriss der Encyklopädie und Methodologie der Medizin* (1857).

FÖRSTER, ERNST (1800-85). A German art critic and painter, brother of Friedrich Christoph, the historian and poet. He was born near Camburg, Saxe-Meiningen, April 8, 1800, and at first applied himself to the study of theology and philosophy, but soon devoting himself to art, entered the studio of Peter Cornelius at Munich. He was employed in painting the frescoes in the Aula at Bonn, and those of the Glyptothek and the arcades at Munich; but his reputation rests chiefly on his discovery of several ancient pictures, and on his works on the history of art. His greatest discovery was the frescoes of Avanzo, which date as far back as 1376, in the Chapel of San Giorgio at Padua. Among his paintings are "Hellas Liberated," and portraits of the Duke and Duchess of Altenburg and children. Among his frescoes are scenes from Goethe's poems, and scenes from Wieland's *Musarion* and *Die Grazien*, Royal Palace, Munich. Among his works are excellent guide-books to Munich, Italy, and Germany; *Die Wandgemälde der Sanct Georgenkapelle zu Padua* (1859); *Vorschule der Kunstgeschichte* (1862); *Denkmale deutscher Baukunst, Bildnerei und Malerei* (1853-69); *Geschichte der deutschen Kunst* (1851-60); *Geschichte der italienischen Kunst* (1869-78); *Peter von Cornelius* (1874). Most of these works were illustrated by woodcuts after his own designs. He wrote a life of Jean Paul Richter, who was his father-in-law, and edited several of his works. He died at Munich, April 29, 1885.

FORSTER, fôr'stâr, FRANÇOIS (1790-1872). A French engraver, born at Locle, Switzerland. He studied in Paris under the engraver Langlois, and then entered the Ecole des Beaux-Arts, where he won the Grand Prix de Rome in 1814. He engraved a number of historical subjects and portraits which have given him some reputation. Among these are: "Francis I. and Charles V. Visiting the Church of Saint Denis" (1833, after Gros); "The Madonna of the House of Orleans" (1838, after Raphael); and the portraits of Raphael, Humboldt, Wellington, and others.

FÖRSTER, fôr'stêr, FRANZ (1819-78). A German jurist. He was born at Breslau, and in 1874 was appointed director in the Ministry of Ecclesiastical Affairs. He assisted in the compilation of the new Prussian Code of Judicial Procedure, and wrote several standard works on Prussian law, which include: *Preussisches Grundbuchrecht* (1873), and *Theorie und Praxis des heutigen gemeinen preussischen Privatrechts* (7th ed. 1896-97).

FÖRSTER, FRIEDRICH CHRISTOPH (1791-1868). A German historian and poet, brother of Ernst, the painter. He was born near Camburg, Saxe-Meiningen, and studied theology at Jena, but subsequently devoted his attention for a time chiefly to archaeology and the history of art. On the uprising of Prussia against France in 1813 he joined the Lützow sharpshooters to-

gether with Theodor Körner, and, like him, wrote spirited war-songs, many of which appeared in his *Gedichte* (1838). At the close of the war he was appointed professor in the school of engineering and artillery in Berlin, but on account of certain democratic writings he was dismissed in 1817. He then became connected with various literary journals, among them the *Neue Berliner Monatsschrift* and the *Vossische Zeitung*, and in 1829 was made curator in the Royal Museum of Berlin. His writings include: *Albrecht von Wallenstein* (1834); *Gustav Adolf* (1833), an historical drama; *Preussens Helden in Krieg und Frieden* (1846), a severely criticised history of Prussia from 1640 to 1815; and a partial autobiography published posthumously in 1873, under the title *Kunst und Leben*.

FORSTER, GEORG (1754-94). A German traveler and naturalist, born near Danzig. When seventeen years old he accompanied his father, Johann Reinhold Forster, in Captain Cook's voyage around the world, and on his return collaborated with him in an account of it, written in English, and entitled *Observations Upon a Voyage Around the World* (2 vols., 1777). After some time spent in Paris, where he made the acquaintance of Franklin, he accepted a professorship of natural history at Cassel in 1779, and in 1784 was appointed to a similar position at Vilna. In 1787 he was called to Russia by Catharine II. to undertake a voyage of discovery, which was abandoned on the outbreak of the Turkish War. In the following year he accepted the office of librarian to the Elector of Mainz. After the taking of Mainz by the French in 1792, Forster, who had become an enthusiastic republican, went to Paris as the representative of the city, to secure its incorporation in the Republic. In the recapture of Mainz by the Prussians in the next year he lost his library and collections, and determined to remain in Paris, where he died in 1794, while preparing to make an extensive trip to East India. Besides numerous briefer works on scientific subjects, he wrote *Kleine Schriften: ein Beitrag zur Länder- und Völkerkunde, Naturgeschichte und Philosophie des Lebens* (1799-97); and *Ansichten vom Niederrhein, von Brabant, Flandern, Holland, England und Frankreich* (1790-91). His letters were published by his wife, Therese, afterwards Therese Huber (2 vols., 1829), and his complete works edited by his daughter, with a characterization of the author by Gervinus (1843). For his *Life*, consult: König (Leipzig, 2d ed., 1858) and Leitzmann (Halle, 1893).

FÖRSTER, fôr'stêr, HEINRICH (1800-81). A German Roman Catholic prelate. He was born at Grossglogau, was educated at Breslau, and in 1837 was appointed chief preacher at the Cathedral of Breslau. In 1853 he was elected Bishop. At the numerous synods and councils which he attended he revealed himself as a staunch defender of the orthodox Roman Catholic creed, although he opposed the dogma of infallibility at the Council of the Vatican. In 1875, after repeated conflicts with the Prussian May laws (q.v.), he was deposed from his see. He was a famous pulpit orator. His principal works are: *Der Ruf der Kirche in die Gegenwart* (4th ed. 1879); *Die christliche Familie* (6th ed. 1893); *Kardinal Diepenbrock. Ein Lebensbild* (3d ed. 1878); *Gesammelte Kanzelvorträge* (5th ed. 1879).

FORSTER, JOHANN REINHOLD (1729-98). A German traveler and naturalist. He was born in Dirschau, was educated for the clerical profession at Halle, and in 1753 became pastor at Nassenhuben, near Danzig; but devoted most of his time to mathematics and the natural sciences. In 1765 he accepted an offer made to him by the Russian Government to inspect and report upon the new colonies founded on the banks of the Volga. His irritable temper soon involved him in difficulties with the Russian Government, and in the following year he repaired to England and became teacher of natural history at Warrington, Lancashire. In 1772 he was invited to take part in Cook's second expedition to the South Seas. In 1777 he published, in collaboration with his son, his *Observations upon a Voyage Around the World*, containing the information he had gathered in course of that voyage. In the same year he returned to Germany, and in 1780 became professor of natural history and mineralogy at Halle. Besides the above work, he published *Zoologia Indica* (1781), and *Geschichte der Schifffahrt und Entdeckungen im Norden* (1784).

FORSTER, JOHN (1812-76). An English political and historical writer, born at Newcastle. He was educated for the bar, but early devoted himself to periodical writing. His political articles in the London *Examiner*, for which he began writing in 1832, attracted unusual attention, owing to their vigor and outspoken honesty. In 1846 he succeeded Dickens as editor of the *Daily News*, but resigned the next year to assume the editorship of the *Examiner*, a post which he held for nine years. He is the author of many admirable biographical and historical essays dealing with the statesmen and the times of the English Commonwealth. Among them are: *Lives of the Statesmen of the Commonwealth* (1836-39); *The Debates on the Grand Remonstrance* (1860); *Arrest of the Five Members* (1860); *Sir John Eliot: A Biography* (1864). His literary memoirs are also excellent. The chief are: *The Life and Adventures of Oliver Goldsmith* (1848, enlarged, with a slight change in the title—*Life and Times of Oliver Goldsmith*—1854); *Walter Savage Landor* (1869); *The Life of Charles Dickens* (1872-74); and the first volume of a *Life of Swift* (1876). Forster's style is clear and forcible. He was appointed Secretary to the Commissioners in Lunacy in 1855, and a Commissioner in Lunacy in 1861.

FORSTER, FERSTER, KARL (1784-1841). A German poet. He was born at Naumburg, a son of Johann Christian Förster, preacher in the cathedral in that city. After studying theology and philosophy at Leipzig he was appointed professor of the German language and literature at the Military Academy in Dresden in 1807. He completed Wilhelm Müller's *Bibliothek der deutschen Dichter des 17ten Jahrhunderts*, and wrote many poems, several of which have been set to music. They were collected and published in 1843. His translations from the classic poets of Italy are also justly celebrated.

FORSTER, LUDWIG VON (1797-1863). A German architect, born at Bayreuth. He is chiefly remarkable for the impetus he gave to German and Austrian architecture by the foundation in 1836 of the *Allgemeine Bauzeitung*, a review de-

voted to that subject. Among the buildings erected by him in Vienna are the synagogue in the Leopoldstadt (1838) and the Protestant Church of Gumpendorf (1849). He was also architect for the Elizabeth bridge. All his work is in and near Vienna, and is executed in Renaissance style.

FÖRSTER, RICHARD (1843—). A German archæologist. He was born at Görlitz, and was educated at Jena and Breslau. In 1899 he was appointed professor of archæology at the University of Breslau. His works include: *Der Raub und die Rückkehr der Persephone in ihrer Bedeutung für die Mythologie; Litteratur und Kunstgeschichte* (1874); *Farnesina-Studien* (1880); *Scriptores Physiognomici Græci et Latini* (1893).

FÖRSTER, WENDELIN (1844—). An Austrian philologist and Romance scholar, born at Wildschütz, Bohemia, and educated in Vienna. He was professor at Prague from 1874 to 1876, and at Bonn after 1876. One of his most noteworthy achievements has been the definite establishment of the Breton origin of the Arthurian legend. His numerous publications of the older French writers include: *Elie de Saint Gille* (1876-82); *Li Chevaliers as deus espees* (1877); *Altfranzösische Bibliothek*, vols. i.-xi. (1879-87); *Romanische Bibliothek*, vols. i.-xvii. (1888-1900); *Die sämtlichen Werke von Christian von Troyes*, vols. i.-iii. (1884-90).

FÖRSTER, WILHELM (1832—). A German astronomer, born at Grünberg, Silesia. He studied at Berlin and Bonn, and became professor of astronomy at Berlin in 1863, and director of the observatory in 1865. In 1868 he was also appointed director of the commission established by the North German Confederation, and continued from 1871 by the German Empire, for the determination of standards of measurement. In this capacity he superintended the reorganization of the German system of weights and measures on the metric basis. He was elected president of the International Bureau of Weights and Measures in 1891. In 1892 he assisted in founding the German Society for Ethical Culture. His publications include: *Populäre Mitteilungen* (2 vols., 1879 and 1884); *Sammlung von Vorträgen und Abhandlungen* (2 vols., 1887 and 1890); and *Studien zur Astrometrie* (1888).

FORSTER, WILLIAM (1784-1854). An English philanthropist, born at Tottenham, near London. He became a preacher in the Society of Friends, labored as such in the United States, England, and France, and in 1846 went to Ireland to relieve the distress there caused by famine. In 1849 he was commissioned by the Quaker Yearly Meeting in London to present an address on slavery and the slave trade to rulers of the Christian nations, and within the next few years he had interviews with nearly all the monarchs of Europe, with the President of the United States, and with the Governors of a number of the Southern States. Consult Seebohm (editor), *Memoirs of the Life of William Forster* (2 vols., London, 1865).

FORSTER, WILLIAM EDWARD (1818-86). An English statesman, the only son of William Forster, the Quaker missionary. He was born at Bradpole, Dorsetshire, was educated in Friends' schools at Bristol and Tottenham, and entered

the woolen business at Bradford in 1841, where in the following year he formed a partnership with William Fison in that business, which continued to the end of his life. In 1861 he was elected from Bradford to the House of Commons, and continued to hold his seat by successive re-elections until his death. Forster at once took a prominent part in Parliamentary debates, and came to be looked upon as one of the principal leaders of the advanced Liberals. He took every opportunity of speaking on the question of the reform of the suffrage, and on the outbreak of the Civil War in America, with Cobden and Bright, earnestly opposed every attempt to recognize the Confederacy, and denounced the Government's action in permitting vessels of the *Alabama* type to be built and fitted out in English ports. In 1865 he became Under-Secretary for the Colonies in Lord Russell's Ministry, and in 1868 was appointed by Gladstone vice-president of the Council on Education and a Privy Councillor. In 1869, in spite of opposition from Radicals both in the Church of England and among Dissenters, he secured the passage of the Endowed Schools Bill, and in 1870 introduced the most famous legislative measure connected with his name, the Elementary Education Bill, which is the foundation of the existing national system of education in England. In 1872 he introduced and piloted through the House of Commons the Ballot Bill. In the Gladstone Ministry of 1880, against his own inclination, he accepted the position of Chief Secretary for Ireland. During the winter of 1881-82 several attempts were made on Forster's life by the 'Invincibles,' but he remained resolutely at his post. When, however, in May, 1882, a majority of the Cabinet determined upon the release of Parnell and the other imprisoned leaders, Forster and Lord Cowper, the Lord Lieutenant, who protested against such action, resigned. Although Forster continued to take part in the debates in Parliament, and was re-elected as a Liberal by his constituents in November, 1885, he acted on many questions independently of his party, and was opposed to the Gladstone Home Rule programme. Consult Reid, *Life of the Right Hon. W. E. Forster* (5th ed., London, 1889).

FORSYTH', ANDREW RUSSELL (1858—). An English mathematician, born at Glasgow. He was educated at Liverpool College, and at Trinity College, Cambridge, where he was senior wrangler and first Smith's prize man. He was made fellow of Trinity in 1881, was professor of mathematics at University College, Liverpool, from 1882 to 1883, and lecturer in Trinity College, Cambridge, from 1884 to 1895. He was made a fellow of the Royal Society in 1886, and succeeded Cayley as Sadlerian professor of pure mathematics at Cambridge in 1895. His principal publications are: *Treatise on Differential Equations* (1885); *Theory of Differential Equations of a Complex Variable* (1893, 2d ed. 1900). He has also published numerous memoirs on differential equations and the theory of functions, in the *Transactions of the Cambridge Philosophical Society* and in the *Philosophical Transactions of the Royal Society* (London).

FORSYTH, GEORGE ALEXANDER (1837—). An American soldier, born at Muncy, Pa. At the outbreak of the Civil War he enlisted as a pri-

vate in the Chicago Dragoons. He fought throughout the war successively in the Army of West Virginia, that of the Potomac, and that of the Shenandoah, and was four times wounded in service. He rose to be brevet brigadier-general of volunteers in 1865, was brevetted lieutenant-colonel United States Army, in 1867 (for gallantry at Dinwiddie Court House), and lieutenant-colonel of the Fourth United States Cavalry in 1881. He also obtained the brevet of brigadier-general in the Regular Army in 1868 for conduct in battle with hostile Indians. In 1875-76 he was a member of the board of officers appointed to inspect the armies of Europe and Asia, and from 1866 until his retirement for wounds in 1890 was on staff and frontier service. He published *Thrilling Days in Army Life* (1900) and *The Story of the Soldier* (1900).

FORSYTH, JAMES W. (1836—). An American soldier, born in Ohio. He graduated at the United States Military Academy in 1856, in the Civil War served as captain on the staff of Major-General McClellan during the Peninsular and Maryland campaigns, was brevetted major for gallant services at Chickamauga, and in 1864-65 was assistant adjutant-general of volunteers and chief of staff of Major-General Sheridan. In 1865 he had attained the rank of brigadier-general of volunteers, and brevet brigadier-general United States Army. He was assistant inspector-general of the Department of the Gulf in 1866-67, and in 1869-73 was aide to Lieutenant-General Sheridan. From 1873 to 1878 he was military secretary of the Division of the Missouri, in 1886 became colonel of the Seventh United States Cavalry, in 1894 brigadier-general, and in 1897 was retired with commission as major-general. He published a *Report of an Expedition Up the Yellowstone River* (1875).

FORSYTH, JOHN (1780-1841). An American politician. He was born at Fredericksburg, Va., graduated at Princeton in 1799, and in 1802 was admitted to the bar at Augusta, Ga. He was appointed Attorney-General of the State in 1808, and in 1812 was elected to Congress. He was re-elected in 1814 and 1816, and in 1818 was chosen United States Senator, a position which he held only until the following year, when he was sent by President Monroe to represent the United States as Minister to Spain. While at Madrid he successfully concluded the negotiations which resulted in the sale of Florida to the United States. On his return to the United States in 1822 he was again elected to Congress, and was re-elected in 1824. In 1827 he was elected Governor of Georgia, and on the conclusion of his term of office was for a second time sent to the United States Senate. His advocacy of Jackson's measures and policy won for him in 1834 the appointment of Secretary of State in the latter's Cabinet, in order to accept which he resigned his seat in the Senate. He served as head of the State Department during the remainder of Jackson's Administration, and was continued in office through the entire Administration of President Van Buren, whose friendship he had won in 1831 by ably supporting him when the Senate refused to confirm his nomination as Minister to England. He retired from office with the close of the Administration in 1841, and died the same year.

FORSYTH, Sir THOMAS DOUGLAS (1827-86). An Anglo-Indian legislator. He was born at Birkenhead, and was educated at Sherborne and Rugby. After a distinguished career in India he was in 1860 appointed commissioner in the Punjab, and in 1872 he was intrusted with the task of suppressing the insurrection at Malair Kotla. In the following year he was appointed envoy to Kashgar, and in 1875 was sent in the same capacity to the King of Burma to effect a settlement of the question of the Karens.

FORSYTH, WILLIAM (1812-99). An English author, born at Greenock, Scotland, and educated at Trinity College, Cambridge, where he took his M.A. in 1837. He studied law at the Inner Temple, and began practice in 1839. From 1859 to 1872 he was standing counsel to the Secretary of State for India, and from 1874 to 1880 was a member of Parliament from Marylebone. In the early part of his life his authorship consisted almost entirely of legal works, some of which are of great value, and are considered authorities on the subjects which they treat. He was editor of the *Annual Register* from 1842 to 1868. His published works include: *On the Law of Composition with Creditors* (1841); *The Law Relating to Simony* (1844); *The Law Relating to the Custody of Infants* (1850); *Hortensius* (1849), an historical survey of the law from the earliest times; *History of Trial by Jury* (1852); *History of the Captivity of Napoleon at Saint Helena* (1853); *Civil Liberty and Self-Government* (1856); *Life of Marcus Tullius Cicero* (1863); *Cases and Opinions on Constitutional Law* (1869); *Novels and Novelists of the Eighteenth Century* (1871); *Hannibal in Italy* (1872), an historical drama in verse; *History of Ancient Manuscripts* (1872); *Essays, Critical and Narrative* (1874); and *The Slavonic Provinces South of the Danube* (1876).

FORSYTHIA, fôr-sith'î-â (Neo-Lat., named in honor of William Forsyth, a Scotch botanist). A genus of shrubs of the order Oleaceæ. *Forsythia viridissima* and *Forsythia suspensa*, small Chinese shrubs now commonly cultivated under the names golden-bell and golden-rain, are hardy, and noticeable for their yellow flowers, which appear before the leaves in the spring.

FORT. See FORTIFICATION.

FORT ADAMS. A United States military post, established in 1841, and situated about three miles from the mouth of Narragansett Bay, upon Brenton's Point, the southern boundary of the entrance to the harbor of Newport, R. I. The site of this fort is said to have been occupied for defensive purposes during the American Revolution, and a permanent work of the same name was first garrisoned in 1799. The Government reservation comprises 138½ acres, 21½ of which are covered by the fort proper. In 1902 it was the headquarters of an artillery district, and had a garrison of four companies.

FORTALEZA, fôr'tâ-lî'zâ, or **CEARÁ**. The capital of the State of Ceará, Brazil, situated on an open bay, near the mouth of the Rio Ceará (Map: Brazil, K 4). It is regularly built, with broad and well-paved streets, and is one of the most beautiful cities of Brazil. Though surrounded by a sterile region, it is connected by rail with fertile inland sections. The harbor is subject to constant silting and presents difficulties

of access for large vessels; still Fortaleza ranks as the chief port of the State, and has an active trade in rubber, cotton, drugs, coffee, sugar, and animal products. Fortaleza dates from 1611, when a fort was here established by Amparo to hold the Indians in check and to prevent the Dutch from gaining a foothold in this vicinity. The city is the residence of a United States consular agent. Population, in 1890, 40,902.

FORT ANN. A village in Washington County, N. Y., 12 miles north by east of Fort Edward; on the Champlain Canal, and on the Delaware and Hudson Railroad (Map: New York, G 2). It is a summer resort, and has manufactures of knit goods and pulp. Population, in 1900, 431. A fort was built here by Colonel Nicholson on his futile expedition against Canada in 1709, and was rebuilt in 1757 and named Fort Ann. In 1758, during the French and Indian War, Captain Robert Rogers defeated near here a somewhat smaller force of French and Indians under Marin; and in 1777, during the Revolutionary War, a small force of Americans under Colonel Long, fleeing from Ticonderoga, was defeated here by a force of British, who occupied the partly burned fortifications. Fort Ann was incorporated as a village in 1820.

FORT BLISS (Tex.). A United States military post, originally established in 1868, on the Rio Grande, three miles northeast of El Paso, Tex., and distant from Santa Fé 350 miles. It stands on a reservation of 1265 acres purchased in 1890, and is designed for a garrison of four companies of cavalry or infantry. Post-office and telegraph station are located at the post.

FORT BOWYER. A fort, formerly situated on Mobile Point, at the entrance to Mobile Bay. It was built by General Wilkinson in April, 1813, was garrisoned by General Jackson with 160 men under Major William Lawrence, and on September 14, 1814, was unsuccessfully attacked by a small naval and land force under Capt. W. H. Percy. On February 8, 1815, after the battle of New Orleans, it was again attacked by the British, this time by a superior land force, and on the 11th it surrendered. Consult: Adams, *History of the United States*, vol. viii. (New York, 1889-91); and Lossing, *Pictorial Field Book of the War of 1812* (New York, 1868).

FORT CANBY. A United States military post, established in 1864, on the north side of the mouth of the Columbia River, Washington. It was originally called Fort Cape Disappointment, but the name has since been changed to Canby in honor of the distinguished officer of that name, killed by the Modoc Indians. Its garrison consisted in 1902 of two companies of coast artillery. There are post-office and telegraph stations at the post, and communication is had by steamer and Northern Pacific Railroad with Portland, Ore., 114 miles, and Seattle, Wash., 222 miles.

FORT CASWELL, kâz'wel. A United States military post, established 1825, on Oak Island, N. C., 22 miles from Wilmington, N. C., and two miles from Southport. There is a post-office and telegraph station at the post, which comprises 2325 acres. The garrison consists of four companies of artillery.

FORT CHIPPEWYAN, or **CHIPPWAYAN**. A trading station of the Hudson Bay Company at the southwest end of Lake Athabasca,

Canada, opposite the mouth of the Athabasca River (Map: Northwest Territories, G 3). It is one of the most populous of the far northern stations, owing to the location here of a mission containing about one hundred hardy orphans, sent thither to be trained as future colonists.

FORT CHURCHILL. A trading station of the Hudson Bay Company, at the mouth of the Churchill River on the west shore of Hudson Bay (q.v.) (Map: Northwest Territory, L 3).

FORT CLARK. A United States military post, established 1852, on Las Moras Creek, near Brackettville, Tex., which is the post-office. The reservation comprises 3963 acres; it is 125 miles west of San Antonio on the Southern Pacific Railroad. It is intended for the protection of the southwest frontier and Mexican border, and has quarters and stables for a regiment of cavalry or infantry.

FORT CLINTON. A Revolutionary fort on the Hudson, near West Point, intended to make the river impassable for the British fleet in 1777.

FORT COLLINS. A city and the county-seat of Larimer County, Colo., 74 miles north of Denver; on the Cache la Poudre River, and on the Colorado and Southern Railroad (Map: Colorado, E 1). It has a public library, and is the seat of the State Agricultural College, opened in 1879. The city is the centre of one of the most fertile regions of the State, watered by extensive and efficient systems of irrigation, and is engaged chiefly in agriculture and stock-raising, but has good water-power and some manufactures. Population, in 1890, 2011; in 1900, 3053.

FORT COLUMBUS. A United States military post, established in 1806 on Governor's Island, in the harbor of New York, 1000 yards south of Manhattan Island. The island in 1902 comprised 65 acres, upon which are the fort proper, with quarters for four companies of artillery or infantry, Castle William (military prison), and the headquarters of the Department of the East and of the Military Service Institution of the United States. Governor's Island was first occupied by the Dutch, who called it Nutten Island; afterwards, under the English rule, it was a perquisite of the royal Governors, from which fact it derived its name. In 1710 it became a quarantine station. In 1775 the island was first fortified and occupied successively by the American and the British troops. From 1784 to 1794 it was used as a summer resort and race-course. In 1797, under the fear of war with France, steps were taken to strengthen the defenses here. In 1800 the island was deeded to the United States by the Legislature, and in 1806 a permanent fortification was built by Colonel Jonathan Williams, of the United States Engineers, upon the site of Fort Jay, an early earthwork. In 1812 the 'South Battery' was added to the defenses. At the present time (1902) the garrison consists of four companies of coast artillery. Extensive improvements were begun in 1901, which comprise doubling the area of the island, the erection of new docks, numerous warehouses, barracks, and officers' quarters for the accommodation of a regiment of infantry. For illustration of Castle William, see FORTIFICATION.

FORT D. A. RUSSELL. A United States military post in Wyoming, established in 1867, and occupying a reservation of 4400 acres on a

branch of the South Platte River, three miles from Cheyenne, on the Union Pacific Railroad. It was named after Gen. D. A. Russell, U. S. V., who was killed in the battle of Opequan, September 19, 1864. There are barracks for eight companies of infantry, and post-office and telegraph stations at the post.

FORT DEARBORN. A fort built on the site of Chicago in 1804-05, well known from a massacre which occurred near by, on August 15, 1812. On that day the garrison of 67 men, under Capt. Nathan Heald, evacuated the fort, under orders from Gen. William Hull, and, accompanied by the resident settlers, some thirty in number, including women and children, started for Detroit under the escort of a body of Miami Indians. At a short distance from the fort they were attacked by an ambushed force of about 500 Indians, assisted by most of the escort, and two-thirds of their number were killed and the rest captured. Most of the captives were subsequently ransomed at Detroit. The fort was destroyed on the following day by the Indians, was rebuilt about 1816, was evacuated in 1823, was reoccupied in 1828, and was demolished in 1856. Consult: Wentworth, *Early Chicago*, *Fort Dearborn* (Chicago, 1881); Kirkland, *The Chicago Massacre of 1812* (Chicago, 1893); an interesting narrative in Kinzie, *Wau-bun, or the Early Day, in the Northwest* (Chicago, 1857); and the version, largely from the Indian standpoint, in an article, "The Massacre of Fort Dearborn, Gathered from the Traditions of the Indian Tribes Engaged in the Massacre," by Simon Pokagon, in *Harper's Magazine*, vol. xcvi. (New York, 1899).

FORT DE FRANCE, *fôr de frâns* (formerly Fort Royal). The capital of Martinique (q.v.), situated on the western coast of the island (Map: West Indies, R 7). It has a good harbor and is strongly fortified. In 1902 Fort de France became important as the distributing centre for supplies during the terrible eruptions of Mont Pelée (q.v.). Population, in 1896, 17,800.

FORT DE L'ÉCLUSE, *fôr de lâ'kluz'.* A fortress in the French Department of Ain, about 14 miles south of Geneva (Map: France, M 5). It was erected by the dukes of Savoy, but was repeatedly destroyed by the Swiss during the sixteenth century. Rebuilt by Vauban at the command of Louis XIV., it was dismantled by the Austrians in 1815. Since 1824 it has been restored and strengthened. It occupies a crag 1385 feet high, at the foot of Mont Credo, which commands the passage of the Rhône from Switzerland through the defile of the Ecluse.

FORT DODGE. A city and the county-seat of Webster County, Iowa, 87 miles north by west of Des Moines; on the Des Moines River, and on the Illinois Central, the Chicago, Rock Island and Pacific, and two other railroads (Map: Iowa, C 2). It is an important railroad centre, and has great natural advantages. In the vicinity are vast coal-fields that employ over 2000 men, large deposits of glass-sand and excellent clay, and quarries of brown sandstone. The city has extensive manufactures of stucco and plaster, paints, brick and tile, foundry products, oatmeal, pottery, etc. There are also greenhouses with a large wholesale trade, and repair-shops of the four railroads which enter the city. Fort Dodge

maintains a public library and owns the water-works system. Population, in 1890, 4871; in 1900, 12,162.

FORT DONELSON. See FORT HENRY AND FORT DONELSON.

FORT DOUGLAS. A United States military post in Utah, established in 1862, and occupying a reservation of 9250 acres at the base of the Wahsatch Mountains, 5030 feet above the sea. There is a post-office at the post, and a telegraph station at Salt Lake City, three miles distant. It is 37 miles from Ogden on the Union Pacific Railroad, and has quarters for 500 cavalry or infantry.

FORT DU PONT. A United States military post in Delaware occupying a reservation of 173 acres opposite Pea Patch Island, in New Castle County. The nearest post-office and telegraph station are at Delaware City, Del. The garrison in 1902 included two companies of coast artillery.

FORT DU QUESNE, du'kân'. See PITTSBURG.

FORTE, for'tâ. In music, the Italian term for loud; *fortissimo*, as loud as possible. In scores these expression marks are designated respectively by *f* and *ff*. Occasionally a double *fortissimo* (*fff*) is required, especially in piano arrangements of orchestral works.

FORT EDWARD. A village in Washington County, N. Y., 55 miles north of Troy; on the Delaware and Hudson Railroad (Map: New York, G 2). By means of a dam at this point the Hudson furnishes good water-power, and the village has extensive paper and pulp mills, a shirt-factory, a brewery, a pottery, etc. It is the seat of the Fort Edward Collegiate Institute. First incorporated in 1849, Fort Edward is governed under a charter of 1857, which provides for a mayor, chosen annually, and a village council, elected on a general ticket. The water-works are owned and operated by the municipality. Population, in 1900, 3521.

The site of Fort Edward was known to the French and English in the latter part of the seventeenth century and the early part of the eighteenth as the Great Carrying Place. In 1709 Colonel Nicholson, while on his unsuccessful expedition against Canada, built a stockade on the spot. This fell into decay, but in 1755, during the French and Indian War, another fort, called Fort Lyman at first, but soon renamed Fort Edward in honor of the Duke of York, was erected here. In 1757 the survivors of the Fort William Henry massacre took refuge within its walls. Throughout the French and Indian War and the Revolution, the fort was the starting-point for expeditions against Canada. In 1777 it was for some time the headquarters of General Schuyler, and later was occupied by General Burgoyne. Near here, on July 27, 1777, Jane McCrea (q.v.) was killed by the Indians. Consult: Parkman, *Montcalm and Wolfe* (Boston, 1884), and an article, "Fort Edward in 1779-80," in the *Historical Magazine*, 2d series, vol. ii. (Boston, 1867).

FORTEGUERRI, for'tâ-gwér'râ. Niccolò (1674-1735). An Italian poet, born at Pistoja. Being a younger son, he was destined for the Church, and in 1695 he was sent to Rome to his uncle, Cardinal Fabroni. He accompanied an embassy to Spain, and, now in favor and again disgraced, occupied successively many ec-

clesiastical offices, being secretary of the Propaganda when he died. During his life only a few of his rhymes and prayers were published. His more important works, the *Capitoli* (of which the first edition, under the title of *Rime piacevoli*, appeared in 1765-67), the *Epistole poetiche*, and the satirical epic *Il Ricciardetto* (1738), which he wrote under the pseudonym Carteromaco, were not given to the press until after his death. We owe to him also a blank-verse translation into Italian of the comedies of Terence (1736). In his original works, which, as the form shows, are largely improvised, the satirical element predominates, and bitter attacks upon the monastic orders are not infrequent. Consult the edition of Forteguerra's works in the *Classici italiani* (Milan, 1813), to which is prefixed an Italian translation of Fabroni's biography in Latin; Procacci, *Niccolò Forteguerra e la satira toscana de' suoi tempi* (Pistoja, 1877); Camici, *Notizie della vita e delle opere di Niccolò Forteguerra* (Siena, 1885); Zaccchetti, *L'elemento imitativo nel Ricciardetto* (Reggio, Calabria, 1892); Zaccagnini, *L'elemento satirico nel Ricciardetto* (Pistoja, 1895).

FORT ERIE. A fort, formerly situated in Canada, at the head of the Niagara River, opposite Buffalo, N. Y., on the site of the present village of the same name (population, in 1900, 1000); the scene of considerable fighting in the War of 1812. It was abandoned and partially destroyed by the British on May 28, 1813, and in the succeeding two months was occupied alternately by the Americans and the British. On July 3d it was captured, with a garrison of 170 men, by the American General Jacob Brown (q.v.), and after the battle of Lundy's Lane, July 25, 1814, the whole American army, numbering about 2000 men, was withdrawn thither by General Ripley, who was soon replaced by General Gaines. The British under General Drummond advanced to attack, and from August 7th to August 14th kept up an almost constant bombardment. On November 5, 1814, the fort was blown up by the Americans, and it was never subsequently rebuilt. Consult: Adams, *History of the United States*, vols. vii. and viii. (New York, 1889-91); and Dawson, *Battles of the United States* (New York, 1858).

FORTESCUE, CHICHESTER SAMUEL. See CARLINGFORD, CHICHESTER SAMUEL FORTESCUE, Baron.

FORTESCUE, HUGH, third Earl Fortescue (1818—). An English author and politician, born in London and educated at Harrow and at Trinity College, Cambridge. Lord Melbourne made him his private secretary in 1840. In 1841 he was elected a member of Parliament, and sat continuously until shortly before he succeeded to his father's title and took his seat in the House of Lords (1861). He was a Lord of the Treasury in 1846-47, and secretary of the Poor Law Board from 1847 to 1851. In politics he identified himself with the Liberal-Unionists. He wrote: *Lectures on the Health of Towns* (1845); *Official Salaries* (1851); *Representative Self-Government for London* (1854); *Public Schools for the Middle Classes* (1864); and *Our Next Leap in the Dark* (1884).

FORTESCUE, Sir JOHN (c.1394-c.1476). An English judge. He came of an old Devonshire family and received his education at Exeter College, Oxford. He was King's sergeant-at-law

in 1441, and in the following year became Chief Justice of the King's Bench. It is known, from many records of the time, that in the early part of his career Fortescue was popular as a judge, but later fell into disfavor, because he belonged to the Court party; hence he also supported Henry VI. against Richard of York, and later against Edward IV. Many of his works were written to support the Lancastrian claims. Until the final defeat of the House of Lancaster at Tewkesbury, in 1471, he shared all their fortunes; and during the wanderings abroad, where Fortescue seems to have received the empty title of Chancellor from Henry VI., he wrote, for the instruction of young Prince Edward, his celebrated work, *De Laudibus Legum Angliæ*, a masterly eulogy of the laws of England. At Tewkesbury he fell into the hands of Edward IV., who pardoned him. He died at an advanced age, but the date has not been ascertained. A valuable and learned work by Fortescue, written in English, discussing the differences between an absolute and limited monarchy, was reedited by Plummer in 1885, under the title *The Governance of England*. His other works are numerous, but have little interest. Consult: Plummer, introduction to *The Governance of England* (Oxford, 1885); Gairdner, *The Paston Letters* (London, 1872-75); Clermont's edition of Fortescue's works, in which all writings attributed to Fortescue are published (London, 1869).

FORTESCUE, Sir JOHN (c.1531-1607). An English statesman and Chancellor of the Exchequer. He was a son of Sir Adrian Fortescue, and a great-grandson of Sir John, the Chief Justice. His father was executed when John was eight years old; but the son—possibly educated at Oxford—had his property restored by an act of Parliament in 1551. During Mary's reign his mother was in favor, and he was appointed instructor to the Princess Elizabeth. On the accession of Elizabeth, he was made keeper of the great wardrobe. He entered Parliament in 1572; in 1589 succeeded Mildmay as Under-Treasurer and Chancellor of the Exchequer, a very lucrative post, and in 1601 became Chancellor of Lancaster. This post in the Exchequer he lost when James came to the throne, but the patents for the other two offices were reissued, and he twice entertained the King. In 1604 he was candidate for the seat for Buckinghamshire in an election declared void by the Court of Chancery, and was returned on a second election. The Commons challenged the right of Chancery to decide in such a case, and after compromise on a third election Fortescue was returned in 1606. He died a little less than two years later.

FORT ETHAN ALLEN. A United States military post in Vermont, established in 1892, and occupying a reservation of 761 acres. The post-office is Essex Junction, Vt., distant two miles, and the nearest telegraph station is Burlington, Vt. (six miles away). There are quarters for 800 men, cavalry and artillery, and stables for 600 horses.

FORT FISHER. An earthwork in North Carolina, on the peninsula between the Atlantic Ocean and Cape Fear River, defending the entrance to the port of Wilmington. In the last year of the Civil War this was almost the only

port open to the Confederates, and it became a matter of importance to the Federals to close it. To this end a formidable fleet under Admiral Porter left Hampton Roads on December 13, 1864, and arrived in sight of the fort on December 20th. At 1.40 A.M. on the 24th, the powder-boat *Louisiana*, laden with 215 tons of powder, was exploded within 200 yards of the beach and 400 yards of the fort, but the latter sustained no appreciable damage. Later in the day the fleet opened fire, and in a little over an hour the guns of the fort were silenced. On the 25th the bombardment was renewed in order to cover the landing of the land forces under Gen. Benj. F. Butler, but though a reconnoitring force went within 150 yards of the fort, an assault was deemed unadvisable, and the troops reëmbarked and returned to James River. The fleet, however, remained near the fort, and on January 13, 1865, another military force of 8000 men, under command of Gen. A. H. Terry, was landed. The bombardment was renewed on the 13th and 14th, and on the 15th a joint assault of soldiers, sailors, and marines carried the fort, capturing more than 2000 prisoners and 169 guns. The Union loss was 266 killed and 1018 wounded. Early on the 16th a magazine explosion, probably the result of an accident, killed more than 100 of the Federals and about as many of the Confederates. The Confederates then blew up their remaining works, the control of the mouth of Cape Fear River passed from their hands, and Wilmington was evacuated. Consult: Ammen, *The Atlantic Coast* (New York, 1883); and Johnson and Buel (editors), *The Battles and Leaders of the Civil War*, vol. iv. (New York, 1887).

FORT GAINES. See MOBILE BAY, BATTLE OF.

FORT GAINES. The county-seat of Clay County, Ga., in the southwestern part of the State; on the Chattahoochee River and on the Central of Georgia Railroad (Map: Georgia, A 4). It is the centre of a cotton and fruit-growing region, and has cottonseed-oil mills, brick-yards, etc. Population, in 1890, 1097; in 1900, 1305.

FORT GARRY. See WINNIPEG.

FORT GEORGE. A fort, formerly situated on the Canadian side of the Niagara River almost opposite Fort Niagara (q.v.), and in the village of Newark (now Niagara). On May 27, 1813, it was taken by an American force under the actual command of Col. Winfield Scott and Commodore Perry (the commanding officer, General Dearborn, being ill). On December 10th the fort was evacuated by General McClure, to avoid an attack by a superior British force. Consult: Dawson, *Battles of the United States* (New York, 1858); and Lossing, *Pictorial Field Book of the War of 1812* (New York, 1868).

FORT GETTY, gèt'ti. A United States military post on Sullivan's Island, S. C., north of the main entrance to Charleston Harbor and nearly opposite Fort Sumter. The post-office is Moultrieville, S. C., and the telegraph station Charleston, S. C. There were, in 1902, on the reservation, which comprises 16 acres, permanent quarters for 12 officers and 250 artillerymen, and temporary accommodations for 225 men.

FORT GRANT. A United States military post in Arizona occupying a reservation of

42,341 acres, and originally called 'Camp Grant.' It is situated 2500 feet above the sea, at the junction of the Arivaypa with the San Pedro River, 56 miles north of Tucson, and was established about 1863 by the California Volunteers as a protection against the Apaches to the southern line of travel to California. There are quarters and stables for six troops of cavalry. A post-office and telegraph station is located at the post.

FORT GREBLE. A United States military post occupying a reservation of 80 acres on Dutch Island, R. I., at the western entrance to Narragansett Bay, $3\frac{1}{2}$ miles north of Beaver Tail, $4\frac{1}{2}$ miles west of Newport. The post-office is Jamestown, R. I., and the telegraph station Newport, R. I. The garrison in 1902 consisted of two companies of coast artillery. The post is named after Lieutenant Greble, United States Army, killed at the battle of Big Bethel, Va., in 1861.

FORT GRISWOLD, griz'wold, Conn. See GEOTON.

FORTH. A river and estuary of Scotland. The river is formed by the junction near Aberfoyle of two main headstreams, the Duchray Water, 16 miles long, and the Avonduh, 12 miles long, which rise in the mountains between Lochs Katrine and Lomond in the northwest of Stirlingshire (Map: Scotland, E 3). It traverses a country rich in romantic scenery. From Aberfoyle the Forth winds 39 miles southeasterly to Stirling, and at Alloa, 12 miles beyond, widens into the Firth of Forth (Map: Scotland, F 3). The Firth extends 6 miles southeast, then, with an average breadth of $2\frac{1}{2}$ miles, continues 10 miles to Queensferry, where it contracts to a mile in width and is spanned by the celebrated cantilever railway bridge, opened in 1890. The Firth extends 36 miles farther to the North Sea, expanding in width to 15 miles. The river is navigable to Alloa by vessels of 300 tons, and to Stirling by vessels of 100 tons. A canal 38 miles long connects it with the Clyde. It has important salmon and herring fisheries.

FORT HAMILTON. A United States post, established in 1831, and occupying a reservation of 167 acres on the southwest shore of Long Island. It is one of the principal defenses of New York City, commanding 'the Narrows.' The post-office and telegraph station is Fort Hamilton, N. Y. There are quarters for 650 men and stables for 200 horses. During the American Revolution the British landed here prior to the battle of Long Island, 1776.

FORT HAN'COCK. A United States military post established in 1892, occupying a reservation of 1366 acres at Sandy Hook, N. J., and commanding one of the entrances to New York Harbor. There are post-office and telegraph stations at the post. It was named after Major-General Winfield Scott Hancock, U.S.A. There is an artillery garrison, with quarters for 300 men.

FORTH BRIDGE, THE. A cantilever bridge erected over the Firth of Forth at Queensferry, Scotland, in 1883-90, famous on account of having the longest spans yet attempted. The two main spans are each 1710 feet long, and the total length of the bridge is 8295 feet. The towers are 343 feet in height. The bridge contains 51,000 tons of steel, and the whole cost of construction was about \$13,000,000.

FORT HENRY AND FORT DON'ELSON.

Two forts, twelve miles apart, in Tennessee, prominent in the early period of the Civil War; the first situated on the right bank of the Tennessee River, and the second on the left bank of the Cumberland River, both standing near the line between Tennessee and Kentucky. They were built and strongly manned by the Confederates in 1861, and were the two most important works in the first line of defense in the West. They were especially important in that they controlled the entrance to two avenues by which Tennessee and the States farther south might be entered. Early in 1862, General Grant, stationed at Cairo, asked and received permission to attempt their capture. On February 2d a flotilla of gunboats under Com. A. H. Foote, followed by land troops under Grant, left Cairo, and on the 4th arrived before Fort Henry, which was then defended by 3000 men under General Tilghman. A combined attack by land and water was planned for the 6th, but the fort was taken within an hour on that day by the naval forces alone, some time before the troops arrived. The unavoidable delay of the latter enabled most of the garrison to escape to Fort Donelson, though Tilghman and about 70 of his men surrendered with the fort. On the 12th Grant moved upon Fort Donelson with a force that ultimately numbered 27,000. The fort, having been considerably reinforced, had a garrison of between 18,000 and 21,000, including the commands of Generals Floyd, Pillow, and Buckner. On the 13th Grant began a cannonade, and on the 14th an attack was also made by the fleet; but within two hours every gunboat was disabled, 54 men were killed, and Foote was compelled to withdraw. The Confederates, hoping to open up a way for retreat toward Nashville, attempted a surprise on the morning of the 15th. They were at first successful and actually secured a line of retreat, but they failed to profit by it, and at 3 P.M. Grant, who had been absent during the early part of the engagement, for the purpose of conferring with Commodore Foote, then wounded aboard his flagship, ordered a general advance, drove the Confederates within their own lines, and gained a position within their works. About 2000 on each side were killed or wounded in the course of the day. Grant prepared for a general assault early the next morning; but the Confederate leaders, recognizing the futility of further resistance, decided to surrender. During the night, Floyd with about 1500 men, Forrest with five or six hundred, and Pillow with his staff, escaped, leaving the fort in command of Buckner. This officer had originally been ranked by both Floyd and Pillow, the former of whom, having his unsavory record as Secretary of War in mind, dreaded to surrender for 'personal reasons,' while the latter violently opposed the idea of surrendering at all. On the morning of the 16th Buckner sent a message to Grant proposing an armistice until noon and the appointment of commissioners to settle upon terms of capitulation. Grant returned on the instant the now famous reply: "No terms except an unconditional and immediate surrender can be accepted. I propose to move immediately upon your works." Buckner had no alternative, and at once surrendered the fort with between 12,000 and 18,000 men, at least 40 guns, and a great quantity of ammuni-

tion. The terms of Grant's answer aroused the enthusiasm of the North, where, by a play upon the initial letters of his name, he soon came to be known as "Unconditional Surrender Grant." Consult: *Official Records*, vol. iv. (Washington, 1881); Grant, *Personal Memoirs* (New York, 1895); Johnson and Buel (editors), *Battles and Leaders of the Civil War*, vol. i. (New York, 1887); Force, *From Fort Henry to Corinth* (New York, 1881); and Swinton, *Decisive Battles of the War* (New York, 1867).

FORT HOWARD. A United States military post, established in 1900, and occupying a reservation of 149 acres. The post-office and telegraph station is Baltimore. It is situated at North Point, Patapsco River, $9\frac{1}{2}$ miles from Fort McHenry, and has a garrison of two companies of coast artillery.

FORTIFICATION (Sp. *fortificación*, It. *fortificazione*, Fr. *fortification*, Lat. *fortificatio*, from *fortificare*, to fortify, from *fortis*, strong + *facere*, to make). That branch of military engineering which has to do with the design and construction of temporary and permanent defenses for the protection of military forces under fire. The subject may be divided into Field Fortification, which is properly a branch of Military Field Engineering, and Permanent Fortification, the latter being subdivided into Permanent Land Fortification and Seacoast Defense. This classification will be observed in the present treatment.

FIELD FORTIFICATION.

The chief aim of a commander of a military force operating in the field is to have his (army not only in the best possible condition, but in the best position for conflict with the enemy). In spite of precautions, these conflicts may come about through accident, and an army forced to fight or in danger of attack must use every means at its command to strengthen or fortify a position which may or may not be of its commander's choosing. Often an unexpected collision of some portion of the force with the enemy may develop into a general battle. The army may be surprised in encampment. More frequently, the commanders of the opposing forces will be in a general way aware of the position and strength of the enemy. Each will know whether on the whole he prefers to give battle or to obstruct the progress of his opponent as much as possible without bringing on a general engagement except in positions affording his

er must attack to protect his own supplies. The commander expecting to be attacked will select the best available position for his troops—one which the natural advantages of the ground will make it easier for him to hold and more difficult for his opponent to attack. A section of the line will be assigned to each corps or division of his army. The length of the section thus assigned will vary greatly under different circumstances. Ordinarily, not less than six men, including those in the firing line, supports, and reserves, should be allotted for each yard of the line. Each subdivision, on reaching the portion of the line assigned to it, proceeds as rapidly as possible to fortify—that is, to make stronger its line. If practicable, the position of the line will be indicated by the engineers; otherwise, it will be inspected as soon as possible with a view to strengthening it, wherever opportunity offers.

In the Civil War, especially toward the latter part, the troops, as soon as they arrived on the line, began the construction of light trenches with their bayonets and cups. In several modern foreign armies the troops carry as a part of their equipment small intrenching spades or picks, with which a rifle-pit or lying-down trench (Fig. 1) is hastily constructed.

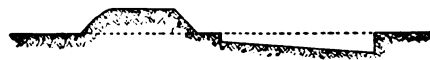


FIG. 1. CROSS-SECTION OF LYING-DOWN TRENCH.



FIG. 2. CROSS-SECTION OF KNEELING TRENCH.

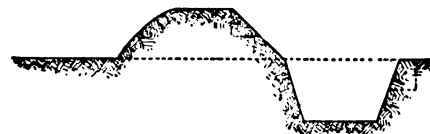


FIG. 3. CROSS-SECTION OF STANDING TRENCH.

If time allows, this is enlarged, first into a kneeling trench (Fig. 2), and then into a standing trench (Fig. 3). The protection furnished by such a trench is ample against infantry fire, as thirty inches of earth will stop or deflect a modern rifle-bullet. See TRENCH.

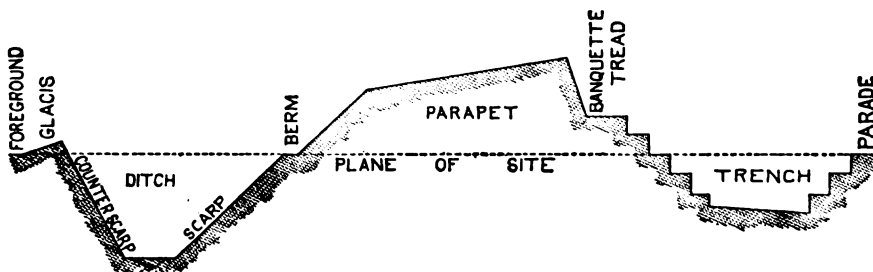


FIG. 4. PROFILE OF FORTIFICATION

army natural advantages. (See RECONNOISSANCE.) The latter course will, in general, be the lot of the weaker. The stronger may also strive to occupy positions which the weak-

The opposing commander, if determined on a frontal attack, will probably make it at the earliest possible moment, in order that the defenders may have the minimum of advantage of

protection from their defenses. His command, too, will probably proceed similarly to strengthen certain portions of their own line, which must be held. If successful in capturing any portion of the enemy's line, he may turn their intrenchments in order to prevent recapture. To



FIG. 5. SHELTER TRENCH—FRONT VIEW.

obviate this the defender, circumstances permitting, will so strengthen his trenches that the parapets shall be able to resist artillery fire.

This requires a thickness in ordinary soil of nine feet or more. The nomenclature of the various portions of the profile is indicated on



FIG. 6. SHELTER TRENCH—REAR VIEW.

the accompanying cut (Fig. 4). If time allows, the interior crest of the parapet will be revetted with sod, fascines, hurdles, logs, sand-bags, gabions, or other available material. Provision will be made for draining the trenches, which will be constructed as inconspicuously as possible. The illustrations (Figs. 5 and 6) show a front and rear view of a shelter trench where pre-

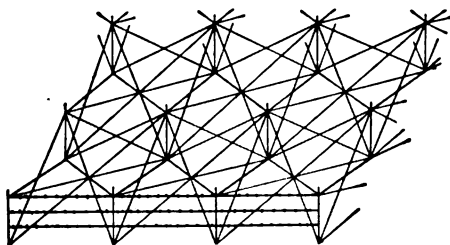


FIG. 7. WIRE ENTANGLEMENTS.

cautions have been taken to hide it from view in front. The ground in front of the trenches within the most effective range of rifle fire should be cleared of everything which would hide an advancing enemy from view, or afford him cover. Obstacles designed to hold an advancing enemy as long as possible under sustained fire will be placed in front of the intrenchments. The

principal modern obstacles are wire entanglements (Fig. 7) and abatis (q.v.). There are also trous-de-loup, or shallow military pits, chevaux-de-frise, crows'-feet, and other similar obstructions. If time allows, a portion of the ground will be mined with charges of explosives (see MINES AND MINING, MILITARY), arranged to fire automatically upon the passage of troops over them. In many cases the site for the defensive line can be so chosen that the land in front shall be marshy, or can be flooded by damming a small stream.

There are usually along the line points naturally much stronger than others. Special pains will be taken to secure and strongly fortify these points by the construction of redoubts, which are inclosed works, usually polygonal, square, or triangular in shape, provided with as many as possible of the structural advantages of regular fortification, and built on a scale commensurate with the strength and character of the force by which they are to be held. These are laid out on the ground in such a way as best to utilize the natural features in securing the maximum effectiveness of the redoubt at a minimum of labor of construction. As guides in making these constructions light frameworks of wood, indicating the proper cross-section, are made and placed in position at the angles of the work. In designing the cross-section for a redoubt or intrenchment, it should be borne in mind that unless the excavation and embankment are equal in amount, earth may have to be carried some distance. In constructing such work it is usually best to assign tasks to each man or squad. About six feet or two paces of crest should be apportioned to each man. After slight experience a man can, under stress, excavate about one cubic yard of ordinary earth in the first hour, provided the lift and throw are not excessive. The amount which he can be counted upon to do per hour diminishes considerably after the first few hours. Traverses (q.v.) should be built where necessary on the works to protect portions of the line which would otherwise be enfiladed by fire from a distance. As soon as possible bomb-proof shelters should be dug out or constructed, and also, if the works are to be held for many days, magazines for the ammunition. The weak points of a defensive line are the flanks. The opposing commander may therefore strive to capture the line by attacking it in flank, where he can bring a heavy fire to bear, and will have to meet only a small fire. It is therefore of great importance that the flanks should, if possible, rest on or near some natural obstacle, as a marsh or river, which will retard the movements of the enemy. If this cannot be done, special provision will have to be made for strengthening and holding them.

During the Mexican War and in recent European wars, villages on the line were frequently placed in a state of defense. This was practicable because of the general use of masonry buildings and walls. The artillery of the defense will be stationed in the intervals between redoubts behind epaulments, constructed by heaping earth in front of the guns, or in gun-pits formed partially by embankments and partially by excavation.

Provision must be made for a system of roads in rear of the line along which troops can

be transferred from one portion of the line to the other, or by which supplies or reserves may be brought, or along which a defeated or demoralized portion of the army can retire to a position in the rear, where it may be re-formed. Bridges or other defiles in rear of the line which may serve as a line of retreat or supply should be well protected by blockhouses or bridge-heads at their ends, which will enable a small force to hold a large one in check while the army is passing.

The fortifications just described are generally known as hasty intrenchments. Where they are more carefully constructed or improved, they become known as deliberate, or semi-permanent, fortifications. The latter term is more particularly applied to the fortifications constructed around an important city which it is thought may become an object of attack on the part of an enemy, and which it is desired to hold at all hazards. They correspond to the permanent fortification applied in Europe to cities of similar importance, the main difference lying in the fact that the works are maintained in time of peace in the permanent system, while semi-permanent works are allowed to fall into disuse upon the cessation of hostilities. These fortifications will be found discussed later in this article, under Permanent Land Fortification.

The main principle upon which field fortifications are based is the fact that men protected by them present but a small target to the fire of the enemy, whereas troops not so protected are exposed. This becomes of great importance at the ranges at which modern battles are fought. (If held by a determined force they greatly increase the possibilities of the defense; and should the attacking force be defeated or become at all demoralized, would constitute a base from which the defenders could make a counter-attack.) They were largely used in the Franco-Prussian, Russo-Turkish, Cuban, Philippine, and South African wars, many instances occurring where a force with their assistance has held in check one many times larger than itself. The general subject of field fortifications has been carefully treated in Fiebeger, *Text Book on Field Fortifications* (New York, 1901).

PERMANENT FORTIFICATION.

Permanent defense or fortification is the art of strengthening in time of peace a position which it is feared may become the objective of an enemy in time of war. Many of its principles are the same as those upon which field fortification is based. The essential differences result from the fact that the latter depend on the movements of an army and are constructed as their necessity becomes apparent, whereas in the former an attempt is made to foresee and to fortify the objective in time of peace. Such fortifications are constructed in advance because it is not believed that a defense commensurate with the importance of the interests at stake can be extemporized in time of war. The same care is used in the design and construction as in such permanent works of civil engineering as bridges, railroads, and tunnels. Especially must they be adapted to the probable form of attack and to the probable garrison available for serving them. As the result of improvements in material and in methods of attack, permanent fortifications eventually become obsolete in cer-

tain respects unless ameliorated to keep pace with these improvements. The essential principle to be kept in view is that the works should be ready to meet the attack when it comes.

A country having no coast-line is, of course, subject only to attacks by land. One having a large seacoast rival and no military powers on its land frontiers is concerned primarily with seacoast defense. The two fundamentally different methods of attack give rise to two general subdivisions of the subject, namely, Land Fortification and Seacoast Defense. Most countries subject to both forms of attack require both methods of defense.

PERMANENT LAND FORTIFICATION.

HISTORICAL DEVELOPMENT. The art of fortification and the methods of attack which the fortifications have been constructed to resist or to supplement have developed together. Each improvement in one has found its counterpart in the other. In different countries the development has not always proceeded in exactly the same way. The constructions have been modified in accordance with the characteristics of the people and with the topographic features of the country. Probably the first attempt at defense consisted in the erection of fences or palisades of wood, intended to serve as physical obstructions to the advance of the attacking force. These appear in various shapes, sometimes being made of stakes driven in the ground and connected by wattling, sometimes by weaving together the branches of the natural growth of the woods, the entrance to the place being by tortuous and concealed routes. These wooden obstructions, which were subject to attack by fire and by battering and cutting tools, were sometimes further fortified by the addition of a second, and even a third, row of stakes. Later, the space between these two lines was filled with earth. (See STOCKADE.) The next general step was the substitution of masonry for wood. These improvements were met by the attack with provisions for escalade. The walls were then increased in height, and escalade became extremely difficult. Battering implements were developed for the purpose of making breaches in the bottom of the wall. These were met by placing earth in rear of the wall, bringing it up to within a few feet of the top, and furnishing a space for the movements of men at the top who could, by throwing missiles from above, interfere with the ordinary operations of the besieger at the bottom of the wall.

As the besieger became more pertinacious, this fire from above became of more importance, provision being made for extending platforms out, thus furnishing better positions from which missiles could be thrown down the face of the wall. To still further facilitate the defense from above, towers were constructed at intervals, from which it was easy to hurl missiles along the face of the wall. These towers were sometimes made so that they could be isolated from the main portion of the wall and would not necessarily succumb to an enemy who had succeeded in reaching the top of the wall. The besieger, to cope with these means of defense, utilized covered timber passages to protect himself from the missiles from above. In this way he was enabled to reach and attack the wall with battering and other implements. As these alone became insufficient to overcome the increased resistance

of the walls of defense, the besieger constructed high wooden towers from which he, in his turn, could hurl projectiles at the defenders on the walls. These towers were attacked by the defender with fire. To prevent them from being burned, the besieger covered them with rawhide. He also made use, either alone or in connection with these towers, of high banks of earth, which were gradually worked forward and higher. To meet these methods and render them more difficult of success, the defense surrounded the walls with large ditches, making provision where practicable for filling them with water at will.

The development of the various forms of bows and of catapults and other machines for throwing stones, etc., rendered the conflicts more severe and widened the area of contact between the defender and besieger. (See ARTILLERY.) Many of the walls constructed were most formidable in their proportions. They included sometimes entire cities. In other cases they were introduced as barriers to the approach of a large section of country, the greatest in length being the Great Wall of China. In Germany development occurred along somewhat different lines. More intricate protection was made in many places. Houses were developed into castles, which were placed in naturally inaccessible positions. They were gradually strengthened by many ingenious devices. The house was surrounded by a ditch, the only method of crossing which was by a drawbridge raised and lowered at pleasure from the castle. Devices such as machicoulis, loopholes, and embrasures, were provided along the outer wall, from which the defender could attack the assailant while being himself fairly well covered. The passage from the drawbridge to the interior could be barred by a portcullis, which was flanked by loop-holed rooms. The interior of the castle was provided with a high tower or keep, capable of defense after the outer walls had fallen.

The foregoing represents, in general terms, the state of the art of fortification at the time of the invention of gunpowder. The general use of the latter caused many changes in the system of fortification, which gave rise, during the nineteenth century, to the development and modification of what is known as the bastion system of defense. This system has exercised such a powerful influence on the development of fortification that a brief account of its history will be of interest. The underlying principles of all fortification are unchangeable; but their application must, of necessity, be affected by every new invention of warfare, mechanical or strategical. Consequently, while the bastion system, as a system, is practically obsolete, its basic features still remain, although in a modified form, and on a correspondingly larger scale.

Much of the nomenclature of the art also had its origin in this system, although many of the terms are now applied to parts of forts, which, in their present form, do not indicate the derivation of the word as originally applied. Reference has been made to the placing of towers at intervals along walls for the purpose of flanking the latter. These towers were either circular in plan, or square, and were known as roundels. The portion of the wall connecting them was called the curtain. The introduction of artillery caused increased thickness and decreased height to be given to the walls, and the roundels were enlarged to permit the introduction of the large

guns. With artillery the besieger possessed an advantage in that they could reach the besieger at a greater distance, and could destroy the various material objects the latter had heretofore used in approaching the walls. The besiegers were obliged to discontinue their wooden constructions and substitute trenches of earth to protect them in their advances. They also constructed breaching batteries at a distance off from the walls for the purpose of playing on the latter, breaking them down and making breaches through which an entrance could be made to the fort. The approach was generally made toward a tower, by zigzag trenches, but pointing, so far as possible, in such a direction as not to be subject to enfilade fire from any other part of the fort. It was observed that in the use of the roundels there were small areas called angles of dead space in front of the towers which could not be well covered by the fire from the tower itself. This led to an alteration of the plan to that of a pentagon, known as a bastion. One side of the pentagon was placed along the line of the wall. The angle farthest from the wall is known as the salient, the two sides adjacent to it as faces, the two sides connecting the faces with the wall as flanks.

This combination of a number of bastions connected with each other by curtains, the whole forming an enceinte, is the basis of the bastion system. The bastions were sometimes filled with earth to the grade where the guns were placed. The top surface of this filling was known as the terreplein. The length and direction of the faces, flanks, and curtain were such as to enable the ground in front of each portion to be flanked by the fire from some other part of the work. In front of the terreplein there was placed a wall originally breast-high, and therefore designated as the parapet. Ramps were inclined planes leading from the terreplein to the main level of the ground in rear, known as the parade. The general mass of the enceinte was sometimes called the rampart, and was of such a height as to afford the required protection to the materials and people in rear. On the outer side of the enceinte was the ditch. The front wall of the enceinte was the scarp. It was found that with this exposed to view the ditch could be reduced by the fire of artillery at a distance. The outer portion, i.e. the counterscarp, therefore, was raised to such a relative height that the masonry of the scarp could not be breached except by batteries coming to the crest of the counterscarp. The ground in front of the counterscarp is the glacis. A depressed road, known as the covered way, running around the work on the counterscarp, was added. As the weak points of the system were developed by attacks, efforts were made to strengthen them. A crescent-shaped work known as the demilune was placed in front of the curtain, and the ditch and covered way were extended around in front of it. To permit its faces better to be flanked, it was given the shape of a redan, and is now generally spoken of as the ravelin. The redan (q.v.) in its simplest form is constructed of two parapets of earth, built so as to form a salient angle, having the apex pointing in the direction of the enemy. It enabled the defense with its fire to enfilade and sometimes to take in reverse batteries which the besieger had succeeded in erecting on the counterscarp for the purpose of taking the adja-

cent bastions. It left, however, the curtain scarp exposed to distant fire. As a defense to this, a detached work, or *tenaille*, was constructed in the ditch in front of the curtain. The gates of the work were usually placed in the middle of the curtain, openings being made through the *tenaille* for the defenders to reach and return from the ravelin. The passageway through the ditch in front of the *tenaille* was sometimes protected with a small earthwork on either side. As the height of the parapet above the terreplein gradually increased, becoming a breast-height wall in name only, there was added immediately in rear a small earthen platform known as a *banquette*, on which the infantry troops could stand in delivering their fire. As a result of the increased power of guns, the length of each front increased. As the fire became more accurate, greater attention was paid to bringing a cross-fire on every portion of the work outside of the enceinte. The bastions were enlarged at the expense of the curtains. Provision was made for works inside the fort, which could be held after the fall of the bastion itself. Those erected in the bastion proper were known as *cavaliers*. The function of the covered way was

Palisades and other obstacles were introduced on the glacis. It was seen that as the fronts were made smaller and increased in number, the general outline of the work approached more nearly to a circle, the adjacent fronts came nearer to being on the same straight line, and capable of supporting each other better in resisting attacks. More attention was given to the use of the most effective angles in the bastion, and corresponding protection of the faces and flanks. Casemates were constructed in the flanks of the bastions for the better flanking of the ditches. To render it more difficult to enfilade the covered way, its crest was made *en crémaillère*. Short traverses were in some cases added. Redoubts were added in the ravelin. The accompanying illustration indicates a typical arrangement of the bastion system toward the end of the eighteenth century. (See Plate of FORTIFICATION, Figs. 1, 1a, and 1b.) The bastion system was used for many years, both for large and small works. In some instances the wall around a whole city, such as that of Paris, consisted of a great number of bastion fronts, while in other cases many small forts, containing all the essentials for their own defense, were constructed. An

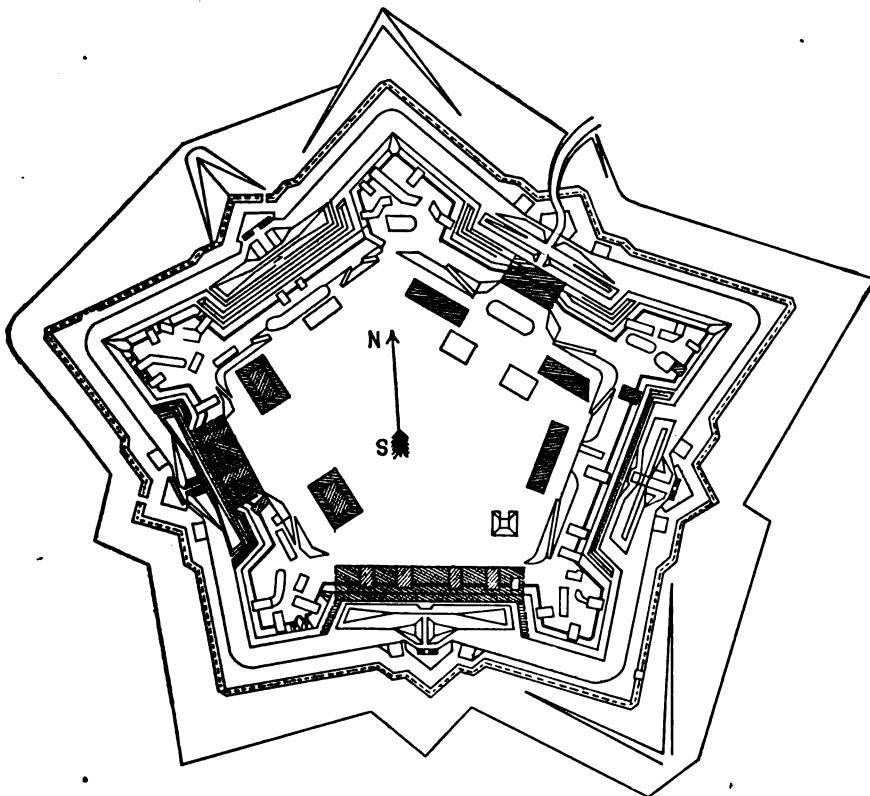


FIG. 8. FORT ISSY—A DETACHED BASTIONED FORT.

enlarged. The covered way itself was increased in size both at its salient and reëtrance, the enlargements being known respectively as salient and reëtrant places of arms. These served as rallying-points for large numbers of defenders, who rushed out in sorties at times when it was thought a counter-attack would most embarrass the besieger.

example of the latter is shown in the illustration of Fort Issy, one of the outer defenses of Paris.

It is not practicable in an article of this length to cite the names of the various engineers who were prominent in the development of the features of the system. It would, however, be incomplete without the names of a few of the more celebrated. Albert Durer, the famous painter, was

is credited with great improvement in the development of roundels. It is not known who first suggested the change to bastions. Daniel Speckles, an engineer in Strassburg in the sixteenth century, devoted much thought to the development of the system and enunciated many principles, the force of which was not fully recognized until a century or more after his death. The system first became largely developed practically in Italy, and then throughout Europe, as a result of the fact that many Italian engineers were employed to develop the system of defenses in other countries. As the system was adopted elsewhere, characteristic national changes were made in it. In Spain the covered way, which is very essential where an active defense is desired, was little used, and sometimes omitted. Provisions for delaying the besieger by more gradual retirement were increased, while those for actively attacking him were diminished.

In Holland the nature of the country led to the use of wide wet ditches. The lack of earth resulted in the use of lower parapets, the main one being sometimes supplemented by a lower one in front for the purpose of covering with its fire the wet ditch. The works were frequently increased in number and made of more complicated plan, rendering an attack more difficult by an assailant unfamiliar with the ground. One of Holland's most distinguished military engineers was Baron Coehoorn (q.v.). In France the art of fortification by the bastion system was reduced to precise rules. The first French author of prominence was Bar-le-Duc, who lived in the latter part of the sixteenth century. Marshal Vauban (q.v.), more generally known than any other engineer in any country as an exponent of the system, was a constructing engineer, and a general, rather than a writer. He is said to have actually besieged over 50 forts, built 35 new ones, and improved some 300 old ones. He also developed the use of ricochet fire and of parallels connecting at intervals the approaches for the attack of forts. The approaches afforded additional opportunities for the establishment of breaching batteries. Later came General Curmontaigne, who brought the bastion system to its most highly developed state.

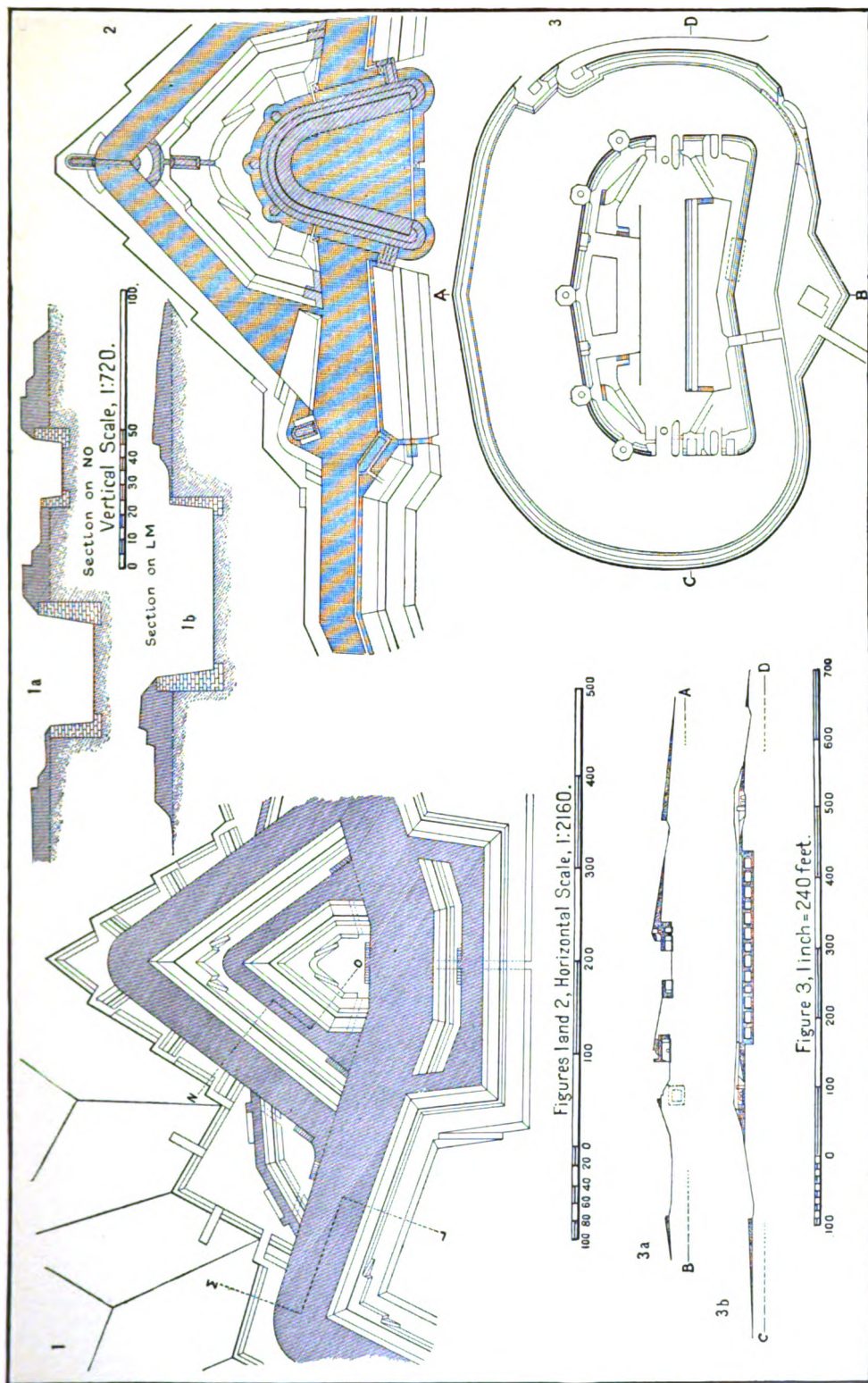
Soon afterwards ideas made their appearance which have since resulted in the development of simpler but stronger fortifications. Montalembert in France recognized the defects of the bastion system, and took the position that a siege had become primarily an artillery contest. He proposed a large use of casemates, which should protect the guns from covered fire. Instead of relying upon bastions in the salients for a flanking fire, he advocated the placing of low caponiers extending from the middle of each front into the ditch. His ideas did not meet with favor in his own country for many years, but were utilized and developed in Germany into what became known as the *polygonal system* of defense. In Sweden the habits and experience of the country led to the development of land fortifications similar to those of ships. The Swedes placed their guns in casemated batteries in two or more tiers for their land fortifications, as well as for coast defense. In Germany the bastion system had never met with great favor. It is here that we find the first extensive use of the polygonal system. The latter differs from the bastion system in the

omission of the bastions and the elongation of the main faces to the angles. It has advantages of saving the labor and ingenuity sometimes required to find suitable locations for the various sides of the bastions. The main faces of the fort adapt themselves more readily to the site. A ditch is provided in front of the enceinte, and a caponiere—that is, a casemated work—is pushed out from the middle of each face into the ditch, having a good flanking fire on the latter. It, in its turn, is protected from a distant fire by its relative lowness as compared with the covered way, or with a ravelin or other outwork placed in front of it. The system was used both for the construction of individual forts and of large enceintes surrounding great cities. Perhaps the most advanced example of its use in the enceinte of a large city is in the one constructed on the north, east, and south sides of Antwerp, Belgium. After the bastion and polygonal systems, what is known as the *tenaille* system was considered as the next most important type of construction. It consisted of a succession of redans joined to each other, giving an alternation of salient and reentrant angles. The main idea was that each face should flank the ground in front of the adjacent one. While stoutly advocated on theoretic grounds, the system was never largely applied in practice.

The many years of war at the beginning of the nineteenth century in Europe furnished a practical test of the fortification systems as they were in existence, and emphasized their defects. It was found that the inclosed enceintes were not large enough to hold a sufficient number of troops and supplies. They were too close to the cities to protect the latter from bombardment as the range of the guns increased. They exercised little influence outside of the reach of their own guns, as they did not contain room enough for a garrison larger than needed for their own service. It was found that unless a number of them surrounded the objective, the large armies simply ignored them by passing out of range of their guns.

The scope of the fortification was, therefore, enlarged by building, in advance of the main enceinte, small forts containing all the elements of defense. A line of these forts inclosed the ground necessary for the encampment of a large army. The new system was known as that of intrenched camps. As greater use was made of curved fire, it became desirable to expose less and less masonry in the scarp walls of the individual forts. In the development of the system of intrenched camps the different countries used different designs for the small forts. As the range of the artillery guns increased, it became evident that the fate of the siege depended less and less on the small, carefully arranged niceties which had been of such value in earlier days. The outer works became simpler and stronger. As the range of the artillery was increased still further by the introduction of longer and more accurate guns, and of shells containing explosives, additional bomb-proof cover in which the defending troops could remain when off duty became more important. It was becoming possible for the defender to compel the attacker to use his batteries at a range nearer to that of ordinary vision. It was found that the high forts and traverses furnished him with an excellent target, and this led to the

FORTIFICATION



1. FRONT OF BASTIONED ENCEINTE; 1a and 1b Vertical Sections. 2. FRONT OF POLYGONAL ENCEINTE.
3. DETACHED POLYGONAL FORT; 3a and 3b Sections through AB and CD.

introduction of attempts to render the forts more nearly invisible. They were made lower, and their outer appearance harmonized more closely with the general surface of the ground. The fire of the guns was then found to attract the artillery fire of the attacker. The guns were taken out of the forts or redoubts and placed in batteries in the intervals between the forts, every attempt being made to conceal their actual position from the attacker.

The defense of Sebastopol in 1854 and 1855, the Civil War in the United States, and the Russo-Turkish War in 1877-78, showed the great value of works adapted to the site, simply and strongly built, with a view to meeting the latest phases of the attack. The more recent introduction of smokeless powder still further emphasized the advantage of invisibility in the works. The redoubts have now become essentially a place for the development of infantry fire supplemented by machine guns, and in some cases small rapid-fire guns. The use of the interior enceinte is becoming less general as the outer line of batteries becomes stronger.

It is apparent that the art of fortification developed slowly but gradually and progressively, for many centuries, but it has been within the last century and a half that radical changes have taken place. New conditions are constantly arising, and it is impracticable to indicate what the art will be in another century. An interesting account of the development of the old-type fortifications is given in Viollet-le-Duc, *Histoire d'une forteresse* (Paris, 1873). A full account of the historical development of the various systems of fortification will be found in *Woolwich Text-Book of Fortification*, part ii. (London, 1893).

MODERN PERMANENT LAND FORTIFICATION. The modern system of permanent land fortification consists of the use of forts d'arret and of intrenched camps. The former are individual

as a typical distance with modern artillery. The main conditions to be fulfilled in determining the distance are—that the works shall be so far to the front that the city cannot be bombarded from any position outside of them without coming under their fire; and that they shall be far enough out to provide sufficient room in their interior for the movements of the army to occupy the place. The accidents of the ground generally control their exact position. A work will be withdrawn or pushed out considerably, as the case may be, for the sake of securing a commanding position. The forts are now arranged essentially for a defense of infantry and machine-gun fire. They are placed at such distance apart along the circle as to enable them to be mutually supporting. Twenty-five hundred yards may be taken as a typical distance. Batteries for guns and howitzers are established in suitable positions in the intervals between the forts. The guns used rarely exceed seven inches in calibre; howitzers of the same or slightly larger calibre are used. The batteries must be so placed that the guns can bear directly on assaulting troops.

There are differences in the practice and views of engineers in the various European countries as to the exact functions of the forts and batteries. According to the practice of some, no guns larger than six-pounders are mounted in the forts. An example of a typical fort on these lines is shown on the accompanying plate (Fig. 3). Others provide for placing larger guns in the forts themselves. The use of iron armor is advocated by some as protection for such guns. Cupolas for 5.9-inch guns, 4.7-inch guns, and for 8.2-inch rifled mortars were established in the triangular forts built for the defenses of Bucharest. It seems to be acknowledged generally that it is no longer desirable to maintain large guns behind ordinary parapets in the forts. It has not yet

been settled, by war experience, whether it is better to keep them in the fort in cupolas, or to take them out, placing them in detached batteries; probably the consensus of opinion is in favor of the latter method. The former certainly has the disadvantage that the besieger in attacking a fort attacks both the infantry and artillery of the defense. In general, the individual forts are designed for a garrison of about one battalion of infantry, an example of a typical

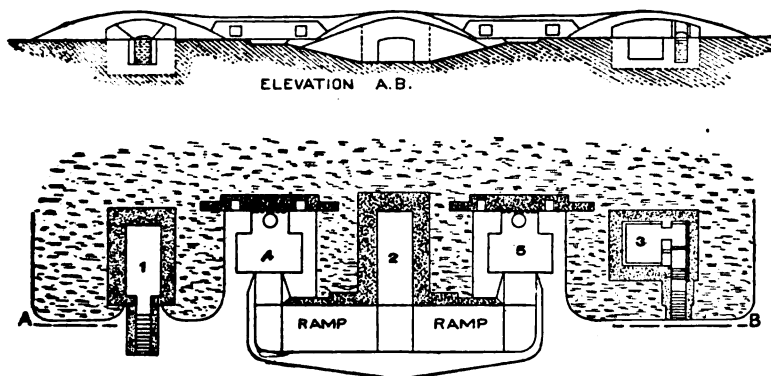


FIG. 9. MODERN BATTERY.

1 and 3, ammunition and stores; 4 and 5, guns; 2, shelter casemate.

forts, complete in themselves, for small or medium-sized garrisons, and are placed for the protection of defiles, such as mountain passes, and of the frontier. (See **FRONTIER, MILITARY.**) The intrenched camp, which has taken the place of the old continuous enceinte as a fortification for cities and positions which it is desired to fortify in advance, consists primarily of an outer line of forts and batteries. The distance of this line from the city to be defended varies greatly in different places. Six thousand yards may be taken

battery being shown herewith.

It is intended to construct an infantry parapet in time of war across the intervals between the forts and batteries, sometimes running in front of them. Openings must of course be provided in this line to permit the egress of the troops making sorties. Arrangements are made for clearing the ground for some distance in front of the forts and batteries, and for the necessary accessories of the defense including such artificial means as towers or balloons, to assist in ob-

serving the enemy's movements; search-lights with which to illuminate his works at night; and for the running of telegraph lines, roads, and railroads. In many cases it is the practice instead of doing all these things in advance, to have projects prepared which include the most up-to-date plans for them. France, Germany, Russia, Austria, all have cities fortified on the above general lines. In many cases, however, the cities were first fortified earlier, and the present fortifications are modifications of the old ones, conforming as near as may be to the modern ideas. Most of the cities, in addition to being defended on the lines indicated, are provided with an interior enceinte, which is an additional security against surprise by any operation of the enemy's troops which may succeed in forcing the outer line. Many engineers are of opinion that an interior enceinte is no longer necessary; that if anything be placed inside it should be simply in the nature of a palisade or similar work, to prevent surprise. Still, the fact remains that most of the cities fortified as intrenched camps have also the enceinte.

PROVISIONAL FORTIFICATION.

Provisional fortification is the same in its function as permanent fortification. It is sometimes known as semi-permanent fortification, sometimes as deliberate fortification. It is used either to complete a system of permanent works which are not complete when war breaks out, or to defend a totally new position that might have been provided with permanent works had it been known definitely that an attack was to be made. Probably the most notable and extensive use of provisional fortification was in the defenses of Washington during the Civil War. The interior cities of the United States are not defended by permanent land works. It is generally believed that they are not required for coping with any foreign foe likely to attack the United States. During the Civil War, however, when the country divided into two parts, the two capitals being so close together as Washington and Richmond were, it became of the utmost importance that Washington should be provided with strong fortifications. In general, the forts were placed at intervals of about 1000 yards, and every prominent point was occupied by inclosed works, every important approach or depression of ground seen from the forts swept by field guns, and the whole connected by infantry trenches. The works were gradually constructed as the war went on; were carefully executed, provided with timber magazines for the ammunition, and with the necessary traverses, bomb-proof shelters, and other essential features. The success of the semi-permanent works of the Civil War, those used by the Turks at Plevna, and of some other works constructed only shortly before hostilities, has caused much attention to be paid to the value of this class of works.

BLOCKHOUSES. In some countries, as, for example, in the case of the Spanish in Cuba during the last insurrection, many towns were surrounded by blockhouses placed in commanding positions and within short distances of each other immediately outside the cities and towns. They were also used in connection with the construction of the famous Trocha, and in the vicinity of many sugar-mills and other valuable properties. Much ingenuity was displayed in the construction

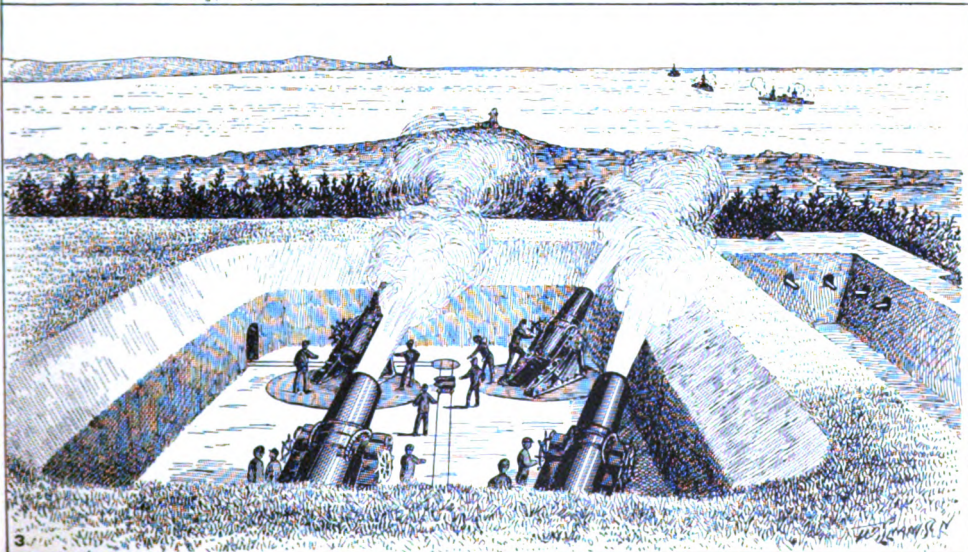
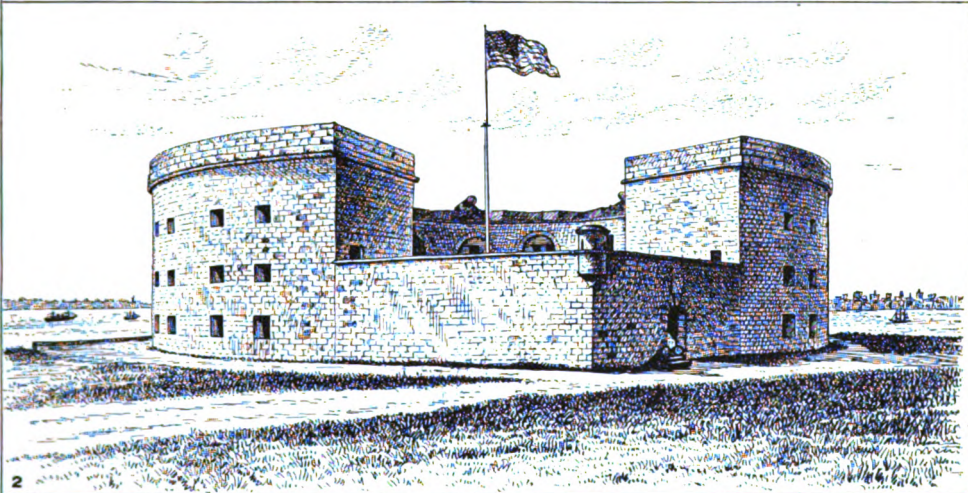
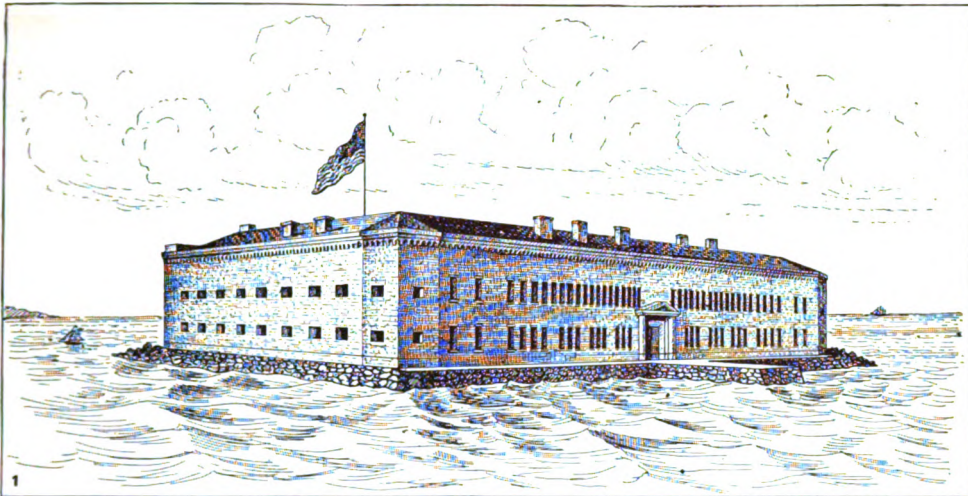
of these houses, the system being developed probably more fully than ever before. They were sometimes frame structures, sometimes masonry, sometimes of boiler iron, and consisted of either one or two stories. Blockhouses are well adapted for use where the enemy from whom the attack is expected is not provided with artillery of sufficient power to demolish them. They were largely used by the British in South Africa.

BIBLIOGRAPHY. For fuller details on the subject of permanent land fortifications, the reader should consult Mahan, *Permanent Fortifications*, revised by Mercur (New York, 1887); Woolwich, *Text-Book of Fortification and Military Engineering*, part ii. (London, 1893); and Lewis, *Permanent Fortification for English Engineers* (Chatham, 1890).

COAST DEFENSE.

Coast defense, in its broadest sense, implies the defense of the coast against hostile attack. This may be made against fortified places by a hostile naval fleet, alone or in conjunction with a landing force; or, a landing may be attempted in an out-of-the-way place by a large army brought in transports convoyed by naval vessels. The latter will probably not be attempted unless the fleet protecting the transports is stronger than any fleet by which it will probably be attacked. Such an attack must be resisted by a stronger army on shore, and becomes, therefore, largely a problem in land warfare. Coast defense, which is discussed fully from the strategic and tactical point of view in another article (see **COAST DEFENSE**), as it is generally understood, has to do only with the resistance of attacks made by fleets. It generally resolves itself into an attack upon a harbor. This may be made for the purpose of securing control of the harbor as a base of operation and supply for the hostile fleet, or for the purpose of forbidding its use by the force of the country attacked; it may be to secure possession of naval docks, yards, and arsenals in the harbor, to prey upon commercial vessels, or to attack an inferior naval fleet which has taken refuge therein. The problem varies greatly, depending upon the population of the country, the occupations of its people, its resources, and the extent of its coast-line. France and Germany in the War of 1870-71 closed their ports for their own traffic as well as that of other countries, and carried on their war entirely on land, neither being in a position to attack the other by sea. England, being largely dependent upon other countries for her food-supply, is therefore bound, for the preservation of her existence, to protect her commerce on the seas. This policy imposes upon her the maintenance of an enormous navy, which was held for many years to be a sufficient protection against any attack that might be made on her shores. She has also, however, adopted the policy of fortifying her principal harbors. (The problem for the United States is at the other extreme. She has an enormous coast-line and a relatively small navy. It has always been her policy to fortify her principal harbors, seacoast cities, railroad terminals, and navy yards, and to leave her navy as free as possible for offensive operation. Guns afloat have an offensive advantage over guns ashore because of their mobility; but for defensive purposes the guns on shore have corresponding advantages over those afloat. They are mounted

FORTIFICATION



1. FORT SUMTER IN 1861.

2. CASTLE WILLIAM, GOVERNOR'S ISLAND, NEW YORK.

3. A MODERN UNITED STATES MORTAR BATTERY.

much more economically, gun for gun, can be fired farther and more accurately, and cannot be tricked away from the place they are intended to defend. Under modern methods of mounting, they present an extremely small exposure to the enemy, whereas the entire ship of the enemy becomes their target.)

HISTORICAL DEVELOPMENT. At the outbreak of the Revolutionary War few ports in the United States had been provided with fortifications; such as had been built were small and weak earth forts. Throughout the early years of the war England's ships were comparatively free to come and go as they pleased, a notable exception being the instance of the repulse of the British fleet by a small fort on Sullivan's Island, Charleston Harbor. Between the Revolutionary War and the War of 1812 some attention was given to the necessity for fortifying the coast, and a few defensive works were built. The best known of these to-day are Fort Columbus (q.v.) and Castle William, on Governor's Island, New York Harbor, which have endured to the present date, although now of little defensive value. During the War of 1812 the English blockaded New York and Boston, but were not able to occupy them; but the damage and demoralization caused by their depredations in Long Island Sound and Chesapeake Bay, to which was added the damage wrought on the city of Washington, produced a deep impression on the public mind as to the necessity for a regular system of fortification. Shortly after this war the general subject was carefully studied by the Board of Engineers of the Army, and work continued to be carried on under the comprehensive system which they inaugurated until the time of the Civil War. Many of the principles which they formulated are still applicable, the general principles underlying their plans, as stated, being as follows:

"The means of defense for the seaboard of the United States, constituting a system, may be classed as follows: First, a navy; second, fortifications; third, interior communications by land and water; and fourth, a regular army and well-organized militia. Fortifications must close all important harbors against an enemy, and secure them to our military and commercial marine; second, must deprive an enemy of all strong positions where, protected by naval superiority, he might fix permanent quarters in our territory, maintain himself during the war, and keep the whole frontier in perpetual alarm; third, must cover the great cities from attack; fourth, must prevent as far as practicable the great avenues of interior navigation from being blockaded at their entrances to the ocean; fifth, must cover the coastwise and interior navigation by closing the harbors and the several inlets from the sea which intersect the lines of communication, and thereby further aid the navy in protecting the navigation of the country; and sixth, must protect the great naval establishments."

Reference has been made to Montalembert and his influence upon the art of fortification in Europe. He had attracted particular attention to the utility of casemates, which, as stated, were from that time forward freely used for many years in the flank defense of land fortifications. They were also deemed particularly applicable to seacoast works, and were used for this purpose in France, England, and Sweden. The first

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prominent example of their use in this country was in old Castle William, which stands as a type of the masonry seacoast fortress of the early part of the nineteenth century. Where used for land fortification, the condition had been imposed that the masonry should not be exposed to the fire of guns, as its destruction was considered to be only a matter of time. The conditions covering the naval attacks of the period in question were, in certain respects, different. The ships were of wood and carried a large number of guns. The general idea of fighting consisted in bringing as many guns as were needed on land into a comparatively small space where the channels were narrow. The attack, instead of being a matter of weeks, as in land fortifications, was expected to be a matter of hours. The wooden sides of the ships were particularly vulnerable, and it was believed that by putting the shore guns behind walls of stone they would be in position to fire much longer than those on ships. The casemate especially lent itself to this style of defense, in that by using it the guns could be placed tier on tier, and even at narrow and restricted sites many guns could be emplaced.

The guns were usually mounted one to each casemate. The scarp wall in front was given a thickness designed to resist the projectiles then in use on ships during the probable time of an engagement. In the latter works this thickness was about eight feet. The walls were thoroughly braced by the sides and tops of the casemates. Much study and attention was given to details, gradual improvements being made permitting a reduction in the size of the embrasures through which the guns were fired, and an increase in their angle of fire. The guns were arranged in the more recent works for a traverse of 30° each way, making a total of 60°. This fact led to the construction of works in the shape of a hexagon. Guns on adjacent faces were enabled to fire parallel to each other when traversed to their extreme position, thus preventing the existence of a dead angle along the capital of the salients. Some of the works were of brick; others of stone. Most of them were provided with a land defense of some nature to assist the garrison in resisting an attack by a landing party. Many of the works are well known, such as Fort Warren in Boston Harbor; Fort Wadsworth, New York Harbor; Fort Sumter, Charleston; and Fort Monroe, Hampton Roads.

About the time of the Civil War, however, there came radical changes in naval ordnance and attack. Rifled guns were introduced and ships were covered with iron. (See GUNS, NAVAL.) The wonderful effect of rifled-gun fire on masonry was shown in the breaching of Fort Pulaski during the Civil War by the breaching batteries established on land by the Federals under General Gillmore. As the war progressed, the Confederate engineers found it desirable to occupy some positions on the seacoast not already fortified. This was done with provisional works of sand and timber. The magnificent resistance made by a work of this character, Fort Fisher, near the mouth of the Cape Fear River, assisted in attracting attention to the value of sand as a defense. Steam had by this time been generally introduced into navies, affording ships more latitude in taking up positions.

These changes led to the introduction of armor in many cases for the protection of forts in Europe, it being argued that if good for the protection of ships' guns, it was good for the protection of forts, and that the latter could use as much of it as needed, whereas the ships were limited by the weight they could carry. In the United States the value of sand as a protection was appreciated. Immediately after the Civil War earthen batteries were built at important positions for mounting some of the smooth-bore guns then available. About 1875, appropriations ceased, and little work except of repair nature was done on the fortifications of the United States until 1890. By this time the rapid strides which had been made along the lines already indicated—that is, the introduction of steam into navies, the addition of improved varieties of armor, and the increase in accuracy and power of rifled guns—rendered the system of fortifications already built practically obsolete, except for certain minor purposes.

MODERN DEVELOPMENT OF COAST DEFENSES IN THE UNITED STATES. The War Department having invited the attention of Congress to the condition of the national defenses, and to the necessity for doing something to place them in better condition, the matter was taken up, and an act was passed in 1885 providing for the appointment of a board to examine and report at what ports fortifications or other defenses were most urgently required, the character and kind of defenses best adapted for each, with reference to armament and the utilization of torpedoes, mines, or other defensive appliances. The board, since known as the Endicott Board, consisted of the Secretary of War, the Chief of Ordnance, and Chief of Engineers of the Army, one other officer from each of these corps, two naval officers, and two prominent civilians. Their report, which was submitted the following year, forms the basis of the present system of fortifications in the United States. As a result of their study they recommended that defenses should be provided for the following ports, which were arranged in the order of their relative urgency: New York; San Francisco; Boston; the Lake Ports; Hampton Roads; New Orleans; Philadelphia; Washington; Baltimore; Portland, Maine; Rhode Island ports in Narragansett Bay; Key West; Charleston, S. C.; Mobile; New London; Savannah; Galveston; Portland, Oregon; Pensacola, Fla.; Wilmington, N. C.; San Diego, Cal.; Portsmouth, N. H.; Cumberland Sound; Kennebec River, Maine; New Bedford, Mass.; Penobscot River, Me.; and New Haven, Conn.

The defenses as to character and kind, with reference to armament, should be fixed and floating, one or both, according to locality, and armed with powerful cannon needed to repel attack from the most formidable ships. The shore batteries were to be armored turrets, revolving or fixed, armored casemates and emplacements in barbette. Earthen parapets and traverses, sometimes arranged with core of concrete or rubble masonry to add resistance to shock, were to be used for barbette batteries.

The Civil War had developed the value of the submarine mine as an element of defense. The Endicott Board laid stress on this element as follows: "It is not generally considered possible to bar the progress of an armored fleet by the

mere fire of the battery; some obstruction sufficient to arrest the ships within effective range of the guns is necessary. The kind of obstruction now relied upon is the torpedo in the form of a submarine mine, and, except in special cases, exploded by electric currents, which are so managed that the operator on shore can either ignite the mine under the ship's bottom or allow the ship to explode it by contact. In deep channels the submarine mines are buoyant; in comparatively shallow waters they are placed upon the bottom; the object in both cases being to touch or nearly approach the hull of the vessel. Submarine mines are not accessories of the defense, but are essential features whenever they can be applied. Bomb-proof operating rooms and tunnels for the conveyance into the water of the electric cables are necessary parts of the system, and must be constructed in advance of the occasion for their use. . . . Heavy batteries and submarine mines are correlative terms of a good defense from the shore. Without powerful guns in the defense the armored ships of the enemy would proceed deliberately to the removal of the mines, either ignoring or silencing the fire of the works, and without the aid of the mines the enemy's vessels could not generally be prevented from running past the batteries."

Special batteries of guns were to be installed for the defense of the lines of mines against the attempt of unarmored or light-armored boats to countermine or grapple for their attachments. When practicable, every mine-field should be commanded by electric search-lights, so that the enemy's attempts at night to tamper with the mines may be detected and rendered abortive.

The necessities of each of the above harbors were studied in the light of the best information available, and the board made definite recommendations as to the number of guns and mortars, submarine mines, electric lights, and local floating defenses necessary for each harbor.

The first fortification appropriation act designed to carry out the recommendations of the Endicott Board was approved September 22, 1888. This act created the Board of Ordnance and Fortification, and made appropriations for commencing the manufacture of modern seacoast ordnance, but made no provision for the construction of any batteries. The first appropriation for the construction of gun and mortar batteries was contained in the act of August 18, 1890, since which time appropriations of varying amounts have been made regularly each year for carrying forward the adopted scheme of coast defense—for the manufacture of ordnance, or the construction of batteries, and for the necessary torpedo defenses.

The defensive details for each locality have been carefully elaborated from time to time by the Board of Engineers in projects which have received the formal approval of the Secretary of War prior to the actual beginning of any work. Up to 1902 projects for permanent seacoast defenses were adopted for thirty-one localities in the United States, as follows: Penobscot River, Maine; Kennebec River, Maine; Portland, Maine; Portsmouth, N. H.; Boston, Mass.; New Bedford, Mass.; Narragansett Bay, R. I.; eastern entrance to Long Island Sound; New York, N. Y.; Philadelphia, Pa.; Baltimore, Md.; Washington, D. C.; Hampton Roads,

Va.; entrance to Chesapeake Bay at Cape Henry; Wilmington, N. C.; Charleston, S. C.; Port Royal, S. C.; Savannah, Ga.; Saint John's River, Fla.; Key West, Fla.; Tampa Bay, Fla.; Pensacola, Fla.; Mobile, Ala.; New Orleans, La.; Sabine Pass, Tex.; Galveston, Tex.; San Diego, Cal.; San Francisco, Cal.; mouth of Columbia River, Oregon and Washington; Puget Sound, Wash.; Lake Champlain.

Of the existing projects for the United States, as enumerated above, many have from time to time been revised to keep pace with the changes in ordnance and ships' armament and construction. At the time the scheme of coast defense was formulated by the Endicott Board, the rapid-fire gun was in its infancy, and ships were characterized by their extremely heavy armament and great thickness of armor. With the rapid development of this weapon and the increase in the resisting powers of armor by means of the Harvey and Krupp processes, there has followed a material change in ship construction, necessitating corresponding changes in the details of coast defenses. In accordance with the recommendations of the Endicott Board, the earlier detailed projects contemplated mounting a considerable number of the heaviest guns at the more important harbors in armored works. The tendency toward a reduction in calibres of heavy guns, coupled with the adoption of a disappearing carriage (see illustration under *ORDNANCE*) for the 12-inch gun, has, up to the present time, rendered armored defenses unnecessary, and the United States has thus far not embarked upon the construction of armored casemates and turrets, to which many European governments stand committed for their land defenses. Although rapid-fire guns were proposed in the earlier projects, no definite numbers or calibres were assigned until 1896, since which time nearly all of the earlier projects have been subjected to revision, resulting in the incorporation of a definite programme as to the rapid-fire armament, a reduction in the number and calibre of the heavy guns, a reduction in the number of mortars, and the general elimination of armored defenses. These revisions have resulted in marked economies, without any sacrifice to the defensive requirements, and they will be continued as changes in ordnance and ships or other causes may render them desirable.

While the inauguration of the modern system of seacoast defenses for the United States dates from 1890, when the first appropriation for constructing gun and mortar batteries was made, it was not until 1896 that Congress began making appropriations commensurate with the magnitude of the undertaking. Stimulated by the larger appropriations of recent years and the War with Spain, the seacoast defenses of the United States were, in 1902, eleven years after the actual commencement of the work, about 50 per cent. completed. Twenty-five of the principal harbors of the United States possess a sufficient number of heavy guns and mortars mounted to permit of an effective defense against naval attack, and considerable progress has been made toward the installation of an adequate rapid-fire armament, which is now a matter of first importance. Most of the heavy guns are now in position, a considerable portion of the light rapid-fire emplacements and some of the rapid-fire guns

are completed, while a beginning has been made of inaugurating the systematic installation of search-light apparatus for night defenses. All torpedo material necessary to enable a quick and effective defense to be made is in store at each harbor for which torpedo defenses are at present projected. With few exceptions, all harbors are now equipped with torpedo storehouses, cable-tanks, and mining casemates.

Extensive torpedo experiments, with a view to improvements in the adopted system, have been carried on at the United States Engineer School and elsewhere, and such experiments, as well as inventions or ideas submitted by individuals, are considered by a board of officers known as the Board on the Torpedo System.

FEATURES OF CONSTRUCTION. Large direct-firing guns are now usually mounted singly, with traverses between them to protect them from enfilade by distant hostile fire, and to limit the destructive effects of projectiles landing in adjacent emplacements. The distances between the guns vary with their size and with the nature of the ground. Where possible, in the case of the larger guns, it is rarely less than 100 feet. Mortars for indirect firing are mounted in pits containing four mortars each. The first requirement for the mounting of a modern gun is a proper foundation from which the gun may be fired, and which will permit it to traverse freely and accurately. While modern guns, as already indicated, have increased remarkably in power in recent years, the weight of the gun proper has not increased in the same ratio. The usual precautions governing the design of foundations for heavy structures of course hold, in the case of guns and mortars, in proportion to their weight. The great increase in power of modern guns has, in addition, rendered corresponding precautions necessary to prevent the gun and carriage from being overturned by the recoil of the piece. Provision is made for offsetting the strain transmitted to the foundation by the weight and distribution of the material of the latter. In the case of some of the high-power English guns, this has resulted in the construction of practically solid concrete bases 25 feet in diameter and 10 feet deep. The traverse circle of the carriage is connected with this base by steel bolts two inches in diameter and extending nearly to the bottom of the base of concrete. A loading platform of suitable dimensions on which the men can work while loading the gun is provided in the rear of the gun. As modern ordnance is loaded at the breech instead of at the muzzle, as was the case for most ordnance used even so recently as during the time of the Civil War, the service of the gun is considerably expedited, and the cannoners are enabled to work in more safety under the cover of the parapet. The latter is a matter of considerable importance, and is placed in front of the gun, connecting with the traverses on the side. Where the gun is mounted on a disappearing carriage its muzzle projects over the parapet only in the firing position and recoils to a position in rear of the parapet for loading. If mounted on a barbette carriage, the gun stands permanently with its muzzle projecting above the parapet. (See illustrations in articles *ORDNANCE* and *COAST ARTILLERY*.) The thickness which should be given the parapet is an open question among engineers. The rule laid down by some

of the best authorities is that it should be 50 per cent. thicker than the greatest penetration of any projectile liable to strike it. The modern method of constructing parapets is to make them of a mass of sand supported by thick retaining walls of concrete immediately in front of the gun. Experience has shown that projectiles striking in the front slope of a thick mass of sand thus backed will usually be deflected upward and pass out through the superior slope of the parapet, doing little damage to it, as the sand drops back approximately into place. Lewis gives the thickness of the concrete retaining wall immediately in front of the gun for English emplacements for high-power guns at from 10 to 15 feet. The superior or upper slope, both of concrete and earth, have a slight slope to the front. The front slopes run off into the natural surface of the ground, and in this and other ways the concealment of the battery is secured in order to make it a difficult target for the enemy on the water.

The main magazine for a fort should consist of a building or buildings at suitable places convenient of access, in which powder in bulk, blank cartridges, shell, etc., may be stored. The service magazine immediately at the gun emplacement should have a capacity for 200 rounds of powder stored in cases and served to the lift by hand, 100 rounds of shell and shrapnel, and 100 rounds of armor-piercing shell served by overhead trolleys to the lifts or cranes. At the time of the Civil War in the United States projectiles had not yet attained a weight too great to be handled by hand by two men. Now the largest of them weigh half a ton, and special appliances in the way of trolleys and wheeled trucks must be provided for handling them expeditiously. Magazines and shell-rooms are placed where most convenient in view of the nature of the ground and the positions of the guns. Frequently they are in the traverses between guns. In view of the disastrous effects that may result from the explosion of a magazine, special precautions are taken to exclude hostile projectiles from it. This is accomplished by placing it in a relatively lower position than the gun, and giving its walls an ample thickness of masonry and earth covering. Moisture is injurious to powder, and although the latter may be ordinarily kept in waterproof cases, many precautions are taken to exclude dampness from the magazines. In view of the fact that the service magazines are of necessity near the coast, and that the air around them frequently contains much moisture, the problem is a difficult one. Careful attention is given to drainage, so that the surface water may be carried off as rapidly as possible. Air-spaces and French drains are provided to intercept water penetrating the mass of the cover. The masonry walls are made as tight as possible and waterproofed. By these means the infiltration of water is prevented. Condensation will, however, occur when damp air is admitted to the magazine and strikes the walls and material at a temperature below its dew-point. The prevention of condensation is a problem of relative heat and cold, and is usually met by attempts at careful regulation of the ventilation, admitting air so far as possible only at times when it is the driest. The walls are also sometimes lined with brick, with a view to absorbing water which may be deposited on them if the

magazines must be opened for a short time at unfavorable periods.

In a modern fortification there are many elements to be considered. Living-rooms for the cannoneers are sometimes built in the emplacements. Provision must be made for lighting the emplacements, magazines, etc., in case of action at night. This was formerly done by means of lamps, but recently in the United States standard specifications have been prepared by a board of engineer officers for electric light and power installations at seacoast batteries. Lookouts for the observation of gun-fire must be built in the flanks of the emplacements, and stairs and ramps provided where necessary in the emplacement for free and easy communication between its various parts.

In the United States the regulations concerning the promulgation of information relative to the permanent works of defense are quite explicit, and forbid the publication of many interesting and significant facts concerning the more modern fortifications. A paragraph in the Army Regulations provides that, "The taking of photographic or other views of permanent works of defense will not be permitted. No written nor pictorial descriptions of these works will be made for publication without the authority of the Secretary of War, nor will any information be given concerning them which is not contained in the printed reports and documents of the War Department." Accordingly, for descriptions of these fortifications, recourse must be had to these reports. The principal ones containing information on the subject are the reports of the chief of engineers of the army, including the reports of the district constructing officers, and the Drill Regulations for Coast Artillery. For the best work of reference, aside from these official sources, consult Abbot, *Defense of the Seacoast of the United States* (New York, 1888). In England, several excellent works on this subject have been prepared for general sale, among which may be mentioned Clarke, *Fortification* (London, 1890), and the various Chatham manuals. See, further, the various articles in this Encyclopædia dealing with military and naval subjects. The use and disposition of troops is discussed under TACTICS, MILITARY; the methods of coast defense are treated under that title; while the various weapons used are described in such articles as ARTILLERY; ORDNANCE; TORPEDOES; COAST ARTILLERY; FIELD ARTILLERY; GUNS, NAVAL; HORSE ARTILLERY; RAPID-FIRE GUNS; ARMOR PLATE; PROJECTILES, etc.

FORTIFICATIONS, ATTACK AND DEFENSE OF. The construction and nature of fortifications have been considered under FORTIFICATION; the present article will discuss the tactics involved in their attack and defense. The subject in its essence is more appropriately treated under SIEGE AND SIEGE WORKS; but in some respects the tactics of field artillery (see TACTICS, MILITARY), with certain necessary modifications, find application, and the latter are considered here. The attack of a fortification is a planned attack on a prepared position; but the field material is supplemented by siege artillery and engineer work. The attack and defense proceed as in the field; the infantry of the attack occupies the foreground; the siege guns are placed in position under its protection, the guns of the defender

are silenced, and the nearer means of defense are destroyed. Meanwhile the infantry moves gradually forward, and finally takes the position by storm. On both sides the work is carried on with energy, to prevent the enemy from having any rest in his work.

The cavalry first incloses the fortification and remains in observation; the infantry then occupies its position deliberately, directing its forces against at least two of the fronts of the fortification, in order to deceive the enemy, preparing against surprise by means of very strong outposts, especially on the front, selected for actual attack, and the latter must generally intrench themselves. As soon as the guns of the enemy are silenced, the works of the enemy are destroyed by the heavy artillery. The infantry can only advance under cover, consequently the outposts are first advanced, and then their previous position is improved during the night to serve as an infantry position, not by running continuous lines (parallels), but by constructing groups of fortifications previously laid out by the engineer officers. Where the infantry cannot be brought forward under natural cover, zigzag approaches must be run. If the infantry position is too far to the rear for the final assault, another, and often a third, must be prepared farther to the front. If the heavy artillery fails to destroy the enemy's works flanking the ditch, the attacker will be forced to begin the tedious engineer attack by the sap. Otherwise the assault is ordered, and is preferably begun in the early morning, and the attack is directed on a broad front. Several false attacks are made at the same time, to deceive the enemy if possible.

The same principles apply in the defense, activity and the offensive being predominant. In the early stages the infantry must go out in the open to attack, but in the later the defense becomes purely passive. See SIEGE AND SIEGE WORKS.

FORTINBRAS. The Prince of Norway, in Shakespeare's *Hamlet*. He covets the lands lost by his father to Denmark, and finally makes an invasion into the latter kingdom. He arrives on the scene in the last act, in time to see Hamlet's death and claim the realm. The part is usually omitted from acting versions.

FORT INDEPENDENCE. A fortification on Castle Island, Boston Harbor, Mass., built on the site of the former Castle William.

FORTIS, *for'tēs*, Abbe GIOVANNI BATTISTA (1741-1803). An Italian traveler and naturalist, born in Padua. He became an Augustinian monk, but was unfitted for a monastic life, and spent his time in travel, studying the natural history of the regions he journeyed through, and recounting his adventures and investigations in writing. His publications include: *Saggio d'osservazioni sopra l'isola di Cherso ed Osero* (1771); *Viaggio in Delmazia* (1774), his best-known work, containing an interesting collection of the folk-songs of the Serbs and Croats; *Della valle vulcanico-marina di Roma* (1778); *Versi d'amore e d'amicizia* (1783); *Mémoires pour servir à l'histoire naturelle et principalement à l'oryctographie de l'Italie, etc.* (1802).

FORT JACKSON. A fort on the right bank of the Mississippi, 78 miles below New Orleans, famous for its resistance to Farragut's fleet and its final capture by the Federals in 1862. It was built in 1824-32, and was enlarged and re-

paired in 1841. Together with Fort Saint Philip, on the opposite bank, a half-mile above, it defends New Orleans from maritime attack. After the passage of the South Carolina ordinance of secession, on December 20, 1860, the State authorities of Louisiana seized these forts, strongly fortified them, and stationed a fleet above. In the spring of 1862, a Federal expedition was organized against New Orleans, and the Confederates, soon hearing of it, greatly strengthened the two forts. The expedition, under the command of Captain Farragut, arrived at the mouth of the Mississippi in March, and on April 18th the powerful mortar flotilla under Commander D. D. Porter opened fire with terrible effect upon the forts. At 2 A.M. on the 24th Farragut's fleet started in single line up the river, and, in the face of a tremendous fire from the two forts and from a Confederate fleet, succeeded in passing first Fort Jackson and then Fort Saint Philip. Soon afterwards the city was occupied by Federal troops, and on the 28th both Fort Jackson and Fort Saint Philip capitulated to Commander Porter, who had remained below. The two forts were under the command of Brig.-Gen. J. K. Duncan, and were garrisoned by about 700 men each. Fort Jackson was under the immediate command of Lieut.-Col. Edward Higgins. The loss of the Federals was 37 killed and 147 wounded, while that of the Confederates is not definitely known. Consult: Johnson and Buel (editors), *The Battles and Leaders of the Civil War*, vol. ii. (New York, 1887); Mahan, *Admiral Farragut* (New York, 1892); and Nicolay and Hay, *Abraham Lincoln: A History*, vol. v. (New York, 1890).

FORT KEOGH, *kē'ō*. A United States military post in Montana, established in 1876, and comprising a reservation of 57,600 acres. There are a post-office and railroad and telegraph station at the post, which is situated on the Northern Pacific Railroad, 746 miles from Saint Paul, Minn. It was named for Capt. Myles Keogh, Seventh United States Cavalry, one of the victims of the Custer massacre. There are quarters for 27 officers and 300 men, and stables for 200 horses.

FORT LAFAYETTE, *lä'fä-ët'*. A fort on the Long Island shore of the Narrows, New York Harbor, in front of Fort Hamilton.

FORT LEAVENWORTH. A United States military post in Kansas, established in 1827 by Colonel Leavenworth, U. S. A. The reserve comprises 6899 acres, all but 939 acres (timber) being on the west side of the Missouri River. It is about 500 miles above the junction of the Missouri with the Mississippi, on the Kansas City, Wyandotte and Northwestern and Missouri Pacific railroads. There are quarters and barracks for 100 officers and 1500 men, with stables for 1000 animals. The station of the general service and staff college (postgraduate), and a garrison comprising a due proportion of cavalry, artillery, infantry, and engineer troops, are located at the post, which has both post-office and telegraph station.

FORT LEE. A fort formerly situated in Bergen County, N. J., on the west bank of the Hudson River, along the lower Palisades. At the old fort here, opposite 160th Street, New York City, General Greene, with 2000 troops, narrowly escaped capture by a force of 5000

British under Cornwallis, on November 20, 1776. Warned just in time, he hastily evacuated the fort and retreated with Washington across New Jersey, leaving behind all his provisions and military stores.

FORT LO'GAN. A United States military post, established in 1887, and comprising a reservation of 640 acres, three miles from Denver, Colo. There are quarters and stables for a squadron of cavalry.

FORT McALLISTER. A strong earthwork, erected by the Confederates during the Civil War on Genesis Point, on the right bank of the Great Ogeechee River, six miles from Ossabaw Sound, and 12 miles south of Savannah, Ga. Early in 1863 Admiral Du Pont, wishing to give the recently constructed monitors a preliminary trial before using them against Fort Sumter (q.v.), ordered the *Montauk* (Commander J. L. Worden), assisted by the gunboats *Seneca*, *Wissahickon*, *Dawn*, and *Williams*, to attack Fort McAllister. Bombardments occurred, without serious damage either to the fleet or the fort, on January 28th and February 28th, the Confederate privateer *Nashville*, which had grounded near the fort, being destroyed on the latter day. On March 30th an eight-hour attack, with little effect, was made by the monitors *Passaic*, *Patapsco*, and *Nahant*, under Commander Drayton. Finally, on December 13, 1864, the fort was assaulted and captured by General Hazen's division of General Sherman's army. This was the concluding operation of Sherman's march to the sea, and led to the surrender of Savannah several days later. Consult: Ammen, *The Atlantic Coast* (New York, 1883); Johnson and Buel (editors), *Battles and Leaders of the Civil War*, vol. iv. (New York, 1887); and Sherman, *Memoirs*, vol. ii. (New York, 1875).

FORT McHENRY. A United States military post, established in 1794. It occupies a reservation of 35 acres, on Whetstone Point, Patapsco River, Md. The post-office and telegraph station are Baltimore, Md., from the centre of which city it is distant three miles. Its site was first occupied for military purposes in 1775. In 1794 it was established as a permanent fortification, and was named after James McHenry, one of Washington's private secretaries during the Revolution, and Secretary of War, 1798. In September, 1814, it successfully withstood a bombardment by the British fleet under Admiral Cockburn. It was this attack which suggested to Francis S. Key his famous ode, "The Star Spangled Banner." During the Civil War the fort was used as a rendezvous and military prison. In 1902 there was an artillery garrison of four companies. Forts Armistead and Carroll are suburbs.

FORT MA'CON. A fort commanding Beaufort Harbor, N. C., taken by Federal land and naval forces on April 26, 1862.

FORT McPHERSON. A United States military post, established in 1867 as McPherson Barracks, and now located on a reservation of 236 acres, acquired by the United States Government in 1886, and situated four miles south of Atlanta, Ga. There are post-office and telegraph stations at the post. There are quarters for four companies of infantry.

FORT MADISON. A city and the county-seat of Lee County, Iowa, 18 miles southwest of Burlington; on the Mississippi River, and on the Atchison, Topeka and Santa Fé and the Chicago, Burlington and Quincy railroads (Map: Iowa, F 4). It is the seat of the State penitentiary, and has the Catermole Memorial Library, and several public parks. A fine railroad and wagon bridge crosses the river at this point. There are pork-packing houses, shops of the Atchison, Topeka and Santa Fé Railroad, foundries and machine-shops, flour and saw mills, farm-implement works, wrapping-paper mills, car-wheel works, and manufactures of automobiles, buttons, boots and shoes, chairs, boxes, tools, etc. Fort Madison was settled in 1832, on the site of a fort dating from 1808, and was incorporated as a town in 1836. The government is administered by a mayor, elected every two years, and a unicameral council. Population, in 1890, 7901; in 1900, 9278.

FORT MEADE. A United States military post, established in 1878, and occupying a reservation of 7842 acres, in Meade County, near Sturgis, S. D., on the Fremont, Elkhorn and Missouri Valley Railroad. There are quarters for 25 officers and 500 men, and stables for 600 horses. It was improved and modernized in 1902.

FORT MEIGS, mēgz. A former fort at the Maumee Rapids, in northwestern Ohio, famous for its defense by the Americans against the English and Indians during the War of 1812. General Harrison had established his advanced post here after the 'Massacre of the River Raisin' (see FRENCHTOWN), and on May 1, 1813, the British General Proctor, at the head of more than 2200 men (including about 1500 Indians under Tecumseh), began an attack, which lasted, with little intermission, until the 5th. On this day an American reinforcement of about 1100 men, under Gen. Green Clay, arrived, and a battle, or series of battles, ensued, without decisive result. Proctor, however, seeing the hopelessness of further attack, and being considerably weakened by Indian defections, withdrew from the vicinity of the fort on the 9th. Consult: Dawson, *Battles of the United States* (New York, 1858); and Lossing, *Pictorial Field Book of the War of 1812* (New York, 1868).

FORT MERCER. An abandoned fort at Red Bank, N. J., on the Delaware River, which during the Revolutionary War formed one of the defenses of the city of Philadelphia. Immediately after occupying Philadelphia, in 1777, Sir William Howe (q.v.) perceived the necessity of securing Forts Mercer and Mifflin, in order to open communication by water with New York, and thus prevent the forcing of his army into a state of siege. Late in October, accordingly, a force of about 2500 picked men, mostly Hessians, under Colonel Donop, was sent against Fort Mercer, and a supporting fleet was ordered up the river. On the 22d the Hessians attacked with vigor, but were fiercely beaten back by the small American garrison, numbering 300, under Col. Christopher Greene, and were finally forced to withdraw. After the capture of Fort Mifflin (q.v.), Fort Mercer was abandoned (November 20th) by the Americans, and soon afterwards was destroyed by the British. Consult: Dawson, *Battles of the United States* (New York, 1858); and

Lowell, *The Hessians in the Revolution* (New York, 1884).

FORT MIFFLIN. A fort on Mud Island, in the Delaware River, near the mouth of the Schuylkill River. It is one of the defenses of the city of Philadelphia, and in American history is well known for its siege and capture by the British during the Revolutionary War. Together with Fort Mercer (q.v.), on the New Jersey shore, it controlled the approach by water to Philadelphia, and when that city was captured by Sir William Howe, in 1777, shut the British off from communication with their fleet, and obstructed the passage of supplies. On October 23d it was bombarded for several hours, but with little effect, by a British fleet, assisted by a land battery, an American fleet (called the Pennsylvania Navy), under Col. John Hazelwood, coöperating with the fort, which was then garrisoned by only 300 men, under Col. Samuel Smith. Finally, the British erected a strong battery on Province Island, and greatly reinforced their fleet. On the 10th of November they again attacked, and after an almost constant bombardment for six days the Americans evacuated the fort and crossed over to Fort Mercer. An extended account of Fort Mifflin during the Revolution is given in Wallace, *An Old Philadelphian*, Colonel William Bradford (Philadelphia, 1884). Consult also Dawson, *Battles of the United States* (New York, 1858).

FORT MIMS, MASSACRE OF. An Indian massacre on August 30, 1813, during the Creek War, at Fort Mims, a temporary stockade 35 miles north of Mobile, Ala. On the outbreak of the war, 553 men, women, and children had assembled here for protection, under the command of Dixon Bailey; but were surprised by a greatly superior force of Indians, under the half-breed Weathersford, at noon on August 30th, and, though they offered brave resistance, all of them were killed, except 15 who escaped, and a few negroes and half-breeds, who were taken prisoners. Consult: Pickett, *History of Alabama*, vol. ii. (Charleston, 1851); Lossing, *Field Book of the War of 1812* (New York, 1869); and Dawson, *Battles of the United States* (New York, 1858).

FORT MONROE. A United States military post, situated at Old Point Comfort, Elizabeth City County, Va., and commanding the entrance to Hampton Roads. There is a post-office and telegraph station at the post, which includes a reservation of 282 acres. The station of the Artillery School (postgraduate), with quarters for 50 officers and 600 men, is located here. For two years after the close of the Civil War Jefferson Davis (q.v.) was imprisoned here.

FORT MONTGOMERY. A fort on the Hudson, near West Point, intended to close the river against the British fleet in 1777.

FORT MORGAN. A United States military post in Alabama, occupying a reservation of 322 acres on Mobile Point, the eastern entrance to Mobile Bay, 33 miles from Mobile. The post-office is Mobile, and there is a telegraph station at the post. The garrison in 1902 consisted of two companies of coast artillery. See **MOBILE POINT**.

FORT MOULTRIE, mól'trī. A fort on Sullivan's Island, at the entrance to Charleston Harbor, notable for its defense against the British in

the Revolutionary War. In the summer of 1776 Sir Peter Parker, with a fleet, and Sir Henry Clinton, with a force of British regulars, proceeded to Charleston Harbor for the purpose of taking Charleston, and of using that place as a base of operations against the Southern Colonies. A total American force of about 6500 had assembled for the defense of Charleston, of which 435, under Col. William Moultrie, were stationed in an unfinished fort, then known as Fort Sullivan, at the eastern end of Sullivan's Island. On June 28th Sir Henry Clinton took up a position on the sand-bank near Sullivan's Island, with the intention of crossing over and making a land attack. Meanwhile Sir Peter Parker, with his fleet, made a vigorous attack on the fort; but, after an artillery duel lasting almost ten hours, was forced to withdraw. Owing to the depth of the shoals, through which he had expected to reach Sullivan's Island, Clinton was detained on the sand-bank, and virtually took no part in the engagement. The effect of the victory was to insure the Southern States from invasion for almost two years. Subsequently the name of the fort was changed to Fort Moultrie. On May 7, 1780, a short time before the capture of Charleston by the British, the fort was forced to surrender.

Immediately before the outbreak of the Civil War, Fort Moultrie was occupied by the United States garrison assigned for the defense of Charleston Harbor; but on December 26, 1860, the fort being virtually unprotected from land attack, and hostilities appearing imminent between the Federal and State forces, Major Anderson removed the garrison to Fort Sumter (q.v.). A detachment of South Carolina militia promptly took possession, and subsequently during the war Fort Moultrie formed one of the important defenses of Charleston against Federal attacks. Consult: Dawson, *Battles of the United States* (New York, 1858); and McCrady, *History of South Carolina in the Revolution, 1775-80* (New York, 1901).

FORT MYER. A United States military post in Virginia, occupying a reservation of 186 acres, on the west bank of the Potomac River, opposite Washington, D. C., which is the telegraph station. There are post-office and telephone at the post, which was named after Gen. A. J. Myer, the founder of the Signal Service, U. S. A. It has quarters for 33 officers and 300 men, and stables for 450 horses.

FORT NIAGARA. A fort at the mouth of the Niagara River, on the American side. La Salle seems to have built a house here in 1669, and a fortified trading-post, called Fort Conti, ten years later; but both were soon destroyed. In 1686 Denonville built here a fort, which was named in his honor. Soon afterwards this place was besieged by the Senecas. In September, 1688, the fort was destroyed and abandoned; but in 1725-26 Vandreuil built here another fort, called Fort Niagara, which was destined to be more permanent, and which was soon recognized, not only as the most important military station on the Great Lakes, but also as perhaps the greatest trading-post in the country. During the French and Indian War it was the objective point of a futile expedition under Governor Shirley of Massachusetts in 1755, and in July, 1759, after a siege of about

sixteen days, was captured by a British and Indian force under Sir William Johnson. In July, 1764, important treaties were made here by Sir William Johnson with various Indian tribes who had participated in Pontiac's War. During the Revolutionary War the fort was the starting-point of many expeditions sent to ravage the Western frontier, was the headquarters for a time of John Butler and Joseph Brant, and was the place where the Wyoming and Cherry Valley expeditions were organized. Finally, in August, 1796, it was evacuated by the British, in accordance with the Treaty of 1783, and was immediately occupied by an American garrison. It was bombarded from Fort George (q.v.), on October 13-14, 1812; was captured by the British on December 19, 1813; and was again surrendered to the United States on March 27, 1815. In May, 1826, various circumstances having combined to make the fort relatively unimportant from a military point of view, the United States garrison was wholly withdrawn. Consult: Porter, *A Brief History of Old Fort Niagara* (Niagara Falls, 1896); Marshall, *The Niagara Frontier* (Buffalo, 1865); and Severance, *Old Trails on the Niagara Frontier* (Buffalo, 1889).

FORT NINETY-SIX (S. C.). See **NINETY-SIX**.

FORTOUL, fôr'tool', HIPPOLYTE NICHOLAS HONORÉ (1811-56). A French author and statesman, best known for his educational policy under the Second Empire. He was born at Digne, and in 1845 became a professor of literature at Toulouse, and afterwards at Aix. In 1849 he was elected Deputy from the Department of Basses Alpes, and joined the party of Louis Bonaparte. After a few months in the Ministry of Marine, he became, on the coup d'état, Minister of Public Instruction, and did his best to serve the new régime, especially in carrying out the law of 1850, in its narrow opposition to the university. He stopped the courses of Jules Simon at the Sorbonne, and retired Quinet, Mickiewicz, and Michelet from the Collège de France; suppressed the chair of philosophy and replaced it by a chair in logic; and introduced the quasi-elective system of bifurcation, or division of science from letters. This last plan, and the introduction in general of practical features—farming in the primary schools and drawing in the *lycées*, for example—were the only points in which Fortoul showed himself an educator, and not a mere politician.

FORT PAYNE. A city and the county-seat of De Kalb County, Ala., 92 miles northeast of Birmingham; on the Alabama Great Southern Railroad (Map: Alabama, D 1). It has coal and iron mining interests, and among its industrial establishments are iron-works, lumber-mills, fire-clay works, etc. Population, in 1890, 2698; in 1900, 1037.

FORT PICK'ENS. A fort on Santa Rosa Island, Fla., commanding the entrance to Pensacola Harbor, and intended as a defense to the harbor and the United States Navy Yard at Warrington. Early in 1861, at the outbreak of the Civil War, it was under the command of Lieut. Adam J. Slemmer (q.v.), who transferred hither the small garrison of Fort Barancas, directly opposite, and with a force numbering only 81, withstood for some time a siege by a large force of Confederates under Gen. Braxton Bragg

(q.v.). Federal reinforcements, under Col. Harvey Brown, arrived in the middle of April to relieve Slemmer and his garrison, and the fort was held by the Federals throughout the war.

FORT PILLOW. A fort in Tennessee, on the east shore of the Mississippi River, about 40 miles north of Memphis, the scene of the so-called 'Massacre of Fort Pillow' during the Civil War. It was constructed by the Confederates, under the direction of General Pillow, in the spring of 1862; but was abandoned and dismantled by them on May 25th of the same year, and on June 5th was occupied by a small Federal force. Subsequently it was a starting-point for a number of Federal raids, but was regarded as of relatively little strategic importance, and was never strongly garrisoned. On April 12, 1864, it was attacked by a strong Confederate force under Gen. Nathan B. Forrest (q.v.). After offering a stubborn resistance, prolonged even when capture had become inevitable, the garrison was overpowered and almost annihilated. The Confederates were accused of having deliberately massacred the Federals, fully half of whom were negroes, after the latter had surrendered, and color was given to the charge by Forrest's summons to surrender, which closed with the words: "Should my demand be refused, I cannot be responsible for your command." The testimony, moreover, of the survivors almost unanimously confirmed the charge. On the other hand, Forrest and his officers always asserted that the resistance of the garrison was insanely and recklessly prolonged; that the garrison never surrendered; that the Confederates ceased firing as soon as one of their own officers had cut down the United States flag; and that no prisoners, white or colored, were killed or maltreated. The Confederate loss was 20 killed and 60 wounded. Consult: Johnson and Buel (editors), *Battles and Leaders of the Civil War*, vol. iv. (New York, 1887); Nicolay and Hay, *Abraham Lincoln: A History*, vol. vi. (New York, 1890); Wyeth, *Life of General Forrest* (New York, 1899); and Mathes, *General Forrest* (New York, 1902), in the "Great Commanders Series."

FORT PORTER. A United States military post, established in 1867, on a reservation of 28 acres, on the Niagara River, within the limits of the city of Buffalo, which is the post-office and telegraph station. Originally, in 1844, there was a defensive work at Black Rock. The fort has quarters for 15 officers and 225 men.

FORT PREBLE, préb'l. A United States military post, established in 1808, and occupying a reservation of 24 acres at Spring Point, on the east side of Portland Harbor, Maine, two miles from the city of Portland, which is the post-office and telegraph station. Its garrison in 1902 was two companies of coast artillery.

FORT PULASKI. A fort erected on Cockspur Island, Ga., for the defense of the Savannah River. It was occupied by the Confederates at the beginning of the Civil War, and on April 11, 1862, after a virgorous bombardment, was captured by the Federals, its garrison then numbering 350 men, under Col. Charles H. Olmstead.

FORTRESS. See **FORTIFICATION**.

FORTRESS ARTILLERY. See **COAST ARTILLERY**; and **ORDNANCE**.

FORTRESS MONROE. See **FORT MONROE**.

FORT RILEY. A United States military post, established 1852, on a reservation of 19,899 acres, on the Kansas River, $3\frac{1}{2}$ miles from Junction City, Kan., which is the telegraph station, post-office, and station of the Kansas Pacific Railroad at the post. This post was first known as Camp Centre, it being considered the geographical centre of the United States; but subsequently was named after Gen. B. C. Riley, U. S. A. It is the station of the United States Cavalry and Field Artillery School (postgraduate), and has quarters for 50 officers and 1350 men, with stables for 1000 horses.

FORT ROBINSON. A United States military post, on White River, 3 miles from Crawford, Neb. There are post-office and telegraph stations at the post, which has quarters for 520 men, and cavalry stables for 530 horses. It was established in 1874, and occupies a reservation of 20 square miles.

FORT ROYAL. See FORT DE FRANCE.

FORT SAINT PHILIP. See FORT JACKSON.

FORT SAM HOUSTON, hū'ston. A United States military post, established in 1865, as the post of San Antonio, Tex., and occupying a reservation of 469 acres, near the city of San Antonio, which is the telegraph station. There is a post-office at the post. There are quarters for 35 officers and 700 men, and stables for 520 animals.

FORT SCHUYLER, ski'lér. See FORT STANWIX; and Rome, N. Y.

FORT SCHUYLER. A United States military post, which forms one of the defenses to the northern entrance to the harbor of New York. The post was established in 1856, although the fortification was begun in 1833. The reservation comprises 82 acres, on Throgg's Neck, Long Island Sound, $3\frac{1}{2}$ miles from Westchester, which is the post-office and telegraph station. There are quarters for 9 officers and 120 men.

FORT SCOTT. A city and the county-seat of Bourbon County, Kan., 100 miles south of Kansas City; on the Marmaton River, and on the Kansas City, Fort Scott and Memphis, the Missouri, Kansas and Texas, and the Missouri Pacific railroads (Map: Kansas, H 4). It is the seat of the Kansas Normal College, and has a public library, an academy for girls, and Mercy Hospital. The city is in a region of great mineral wealth, deposits of coal, flagstone, cement rocks, clays, mineral paints, zinc, and lead being found. There are foundries and machine-shops, flouring-mills and grain-elevators, cement, pottery, brick, and tile works, etc. Population, in 1890, 11,946; in 1900, 10,322.

FORT SHERIDAN. A United States military post, established in 1887, in the State of Illinois, on Lake Michigan, about 25 miles from Chicago. The reservation comprises 632 acres. There is a post-office and telegraph station at the post, which has quarters for a regiment of infantry and a battalion of field artillery.

FORT SMITH. A city and one of the county-seats of Sebastian County, Ark., at the junction of the Arkansas and Poteau rivers, and on the Saint Louis and San Francisco, the Missouri Pacific, the Kansas City Southern, and other railroads (Map: Arkansas, A 2). It has important wholesale jobbing interests in groceries, meats, dry goods, drugs, furniture, leather goods,

etc.; a large trade in coal, corn, cotton, lumber, live stock, and hides; and extensive manufactures of furniture. There are also sawmills, planing-mills, cottonseed-oil mills, etc. Settled in 1838, Fort Smith was first incorporated in 1842, and was chartered as a city of the first class in 1886. Its government is administered by a mayor, chosen biennially, who nominates the board of health, chief of police, and chief of the fire department, and a city council, elected on a general ticket, which controls the appointments to the other municipal offices, excepting the board of school directors, who are elected by the people. The school district has a large fund, derived from the sale of lands donated by the Government; this, with the revenue accruing from taxation, has enabled the city to build a number of fine public schools, the most notable of which is the high school, costing \$60,000. Population, in 1890, 11,311; in 1900, 11,587.

FORT SNEL'LING. A United States military post in Minnesota, at the junction of the Minnesota and Mississippi rivers, seven miles from Saint Paul and eight miles from Minneapolis. It was established in 1820, and embraces a reservation of 1531 acres. There are a post-office and telegraph station at the post, which was named after Col. Josiah Snelling, U. S. A., its first commander. It has quarters for 37 officers and 520 men.

FORT STANWIX. A fort built in 1758, by Brigadier Stanwix, on the site of the present Rome, N. Y., and near the spot where another fort, soon abandoned, had been built in 1756. From its location on the watershed between Lake Ontario and the Hudson, it commanded the principal line of communication between New York and Upper Canada. Here, in the fall of 1768, a treaty was negotiated by Sir William Johnson with the Six Nations, about 3200 Indians being present. The latter agreed, for the sum of \$10,000 in money and goods, to surrender their title to a vast tract of territory which now constitutes Kentucky, West Virginia, and the western part of Pennsylvania. Soon afterwards the fort was dismantled; but in 1776 it was rebuilt and named Fort Schuyler, in honor of Gen. Philip Schuyler. In the following year Col. Peter Gansevoort, with a garrison of about 750, held it from August 3d to August 22d against Saint Leger, with a force of about 1700 British regulars, Tories, and Indians. The fort was destroyed by flood and fire in 1781, but was subsequently rebuilt again as Fort Stanwix, and here, on October 22, 1784, Oliver Wolcott, Richard Butler, and Arthur Lee, acting on behalf of the Continental Congress, negotiated an important treaty with the Six Nations.

FORT STEPHENSON. See FREMONT, Ohio.

FORT STEVENS. A United States military post, at the mouth of the Columbia River, 110 miles from Portland, Ore. It was established in 1864, and includes a reservation of 1250 acres. There are post-office, telegraph, and railroad stations at the post, which has quarters for six officers and two companies of artillery.

FORT STRONG. A United States military post, on the east end of Long Island, Boston Harbor, Mass. The garrison consists of two companies of coast artillery, and there are connected, as subposts, Forts Andrews and Standish.

FORT SUMTER. A fort on an island at the entrance of Charleston Harbor, about three miles from Charleston, the firing upon which by the Confederates, in April, 1861, precipitated the Civil War. Work was begun on the fortifications about 1830, but was subsequently discontinued, and in 1860 the fort was still in an unfinished condition. For illustration, see Plate of **FORTIFICATIONS**. On November 21st Major Robert Anderson replaced Col. J. L. Gardner as commander of the forts in Charleston Harbor, and, like his predecessor, occupied Fort Moultrie (q.v.). Hostilities with the State forces appearing imminent, however, and Fort Moultrie being almost wholly unprotected against land attacks, he secretly removed his small garrison to Fort Sumter, on the evening of December 26th—six days after South Carolina had passed her ordinance of secession. Anderson and his small garrison applied themselves with energy to the strengthening of the fortifications. After much vacillation on the part of the Administration at Washington, an attempt was made in January, 1861, to relieve the scantily provisioned fort; but the *Star of the West*, a merchant vessel which had been sent for this purpose, and which arrived at the mouth of the harbor early on the 9th, was fired upon by the authorities and forced to put back. After the inauguration of President Lincoln, the policy to be pursued with regard to Fort Sumter was the subject of many Cabinet discussions, and, in large part, of the unofficial negotiations between Seward and the Confederate commissioners in Washington. (See **CONFEDERATE STATES OF AMERICA**.) On April 9th President Lincoln notified Governor Pickens that an attempt would be made to send provisions to the fort, and on the 11th, acting under orders from President Jefferson Davis, General Beauregard, in command of the Confederate forces at Charleston, demanded the evacuation of the fort. Anderson promptly refused to withdraw, though, after a prolonged conference with his officers early on the 12th, he wrote: "I will . . . evacuate Fort Sumter by noon on the 15th instant, and I will not in the meantime open my fires upon your forces, unless compelled to do so by some hostile act against this fort or the flag of my Government. . . . should I not receive prior to that time controlling instructions from my Government or additional supplies." This answer proved unsatisfactory, and the bombardment of the fort began at 4.30 A.M., though Anderson did not return the fire until 7 o'clock. Meanwhile, on the same morning, the relieving fleet sent by President Lincoln arrived at the mouth of the harbor, but was able to accomplish nothing. The artillery duel continued throughout the 12th, and during the morning and part of the afternoon of the 13th, when terms of evacuation were agreed upon between Anderson and Beauregard, the garrison, which consisted of only 128 men, leaving the fort on the following day with the honors of war. There was no one wounded or killed on either side during the bombardment. The contest was of immense importance, since it marked the beginning of the Civil War and put a stop to all peace plans and negotiations.

After taking possession the Confederates greatly strengthened the fort, both for offensive and defensive operations. On April 7, 1863, a Federal fleet of nine ironclads—the *Weehawken*, *Passaic*,

Montauk, *Patapsco*, *New Ironsides*, *Catskill*, *Nantucket*, *Nahant*, and *Keokuk*—under Admiral Dupont, attacked the fort with great energy and gallantry; but after an engagement of about two hours and a half was repulsed, the *Keokuk* sinking on the following day, and several vessels being considerably damaged. General Gillmore, the commander of the land forces engaged against Charleston, established breaching batteries on Morris Island, and after a seven days' bombardment, August 17-23, 1863, virtually reduced the fort to ruins. Thenceforth it was garrisoned only by a small force of infantry, which held it in spite of frequent bombardments, a gallant boat attack made by a force of 400 men under T. H. Stevens, on the night of September 8, 1863, and of a disastrous magazine explosion on December 11, 1863, until February 17, 1865, when it was finally evacuated. During 1863-65 Fort Sumter was commanded successively by Colonel Rhett, Major Stephen Elliott, Capt. J. C. Mitchell, and Capt. T. A. Huguenin. On April 14, 1865, by order of Secretary Stanton, General (formerly Major) Anderson raised over the fort the same flag which he had been forced to lower exactly four years before. Consult: *Official Records*, Johnson and Buel (editors), *Battles and Leaders of the Civil War*, vols. i. and iv. (New York, 1887); Anderson, *Political Conspiracies Preceding the Rebellion*; or, *The True Stories of Sumter and Pickens* (New York, 1882); Crawford, *Genesis of the Civil War: the Story of Sumter, 1860-61* (New York, 1887); Doubleday, *Reminiscences of Forts Sumter and Moultrie in 1860-61* (New York, 1876); and Gillmore, *Report on Engineer and Artillery Operations Against Charleston in 1863* (Washington, 1865).

FORT TERRY. A United States military reservation of 150 acres, on Plum Island, between Long Island Sound and Gardiner's Bay, N. Y. The post-office and telegraph station is New London, Conn. The works are garrisoned by two companies of coast artillery.

FORT THOMAS, tōm'ās. A United States military post, established in 1887, consisting of a reservation of 280 acres (including a rifle range of 169 acres). It is situated in Kentucky, on a bluff overlooking the Ohio River, 3 miles from Newport, Ky., and 4 miles from Cincinnati. There are post-office and telegraph station at the post. Quarters are provided for 31 officers and 9 companies of infantry.

FORT TOT'TEN. This post, for many years the headquarters of the United States Battalion of Engineers, was established in 1862, and was originally called Willets Point. The reservation comprises 136 acres on the East River at the western end of Long Island Sound, two and one-half miles from Whitestone. The post-office and telegraph station is Willets Point, N. Y. It is one of the defenses of the northern entrance to New York Harbor. There are quarters for five companies of artillery.

FORT TRUMBULL. A United States military post, established in 1839, and occupying a reservation of 13 acres on the south side of New London Harbor, Conn. In 1777 a small redoubt by this name, and another in 1812, occupied this site. The post-office and telegraph station is New London, Conn. The garrison in 1902 consisted of two companies of artillery.

FORTUNA (Lat., from *fors*, chance, probably connected with *ferre*, to carry). In classical mythology, the goddess of chance, called by the Greeks Tyche. According to Hesiod, she was a daughter of Oceanus; according to Pindar, a sister of the Parce. She differed from Destiny or Fate, in so far that she worked without law, giving or taking away at her own good pleasure, and dispensing joy or sorrow indifferently. She had temples at Sicyrna, Corinth, and Elis. In Italy she was extensively worshiped from a very early period and had many names such as *Patricia*, *Plebeia*, *Equestris*, *Virilis*, *Primigenia*, *Publica*, *Privata*, *Mulieris*, *Virginensis*, etc., indicating the extent and also the minuteness of her superintendence. Particular honors were paid to her at Antium and Praeneste; in the temple of the former city two statues of her were even consulted as oracles. Greek poets and sculptors generally represented her with a rudder, as a symbol of her guiding power, and a cornucopia; or with a ball, or wheel, or wings, as a symbol of her mutability.

FORTUNATÆ INSULÆ. See CANARY ISLANDS.

FORTUNATUS. The chief figure of a popular tale, or rather collection of tales, centring about the fortunes and misadventures of Fortunatus and his sons with a wishing cap and an inexhaustible purse, which prove their possessor's ruin. Many of the materials are ancient, but the composition is German of about 1450. *Fortunatus* was first printed at Frankfurt in 1509 (reprinted in Simrock's *Deutsche Volksbücher*, 1846), and often afterwards in German, French, Italian, Dutch, English, Danish, Swedish, Icelandic. It was dramatized by Hans Sachs (1553), and in English by Thomas Dekker (1600), whose *Old Fortunatus* was turned back into German in 1620. The best modernization of the story is by Tieck in *Phantasiën* (1816). Uhland left an unfinished narrative poem on Fortunatus and the idea was used by Chamisso in his *Peter Schlemihl*.

FORTUNATUS, VENANTIUS HONORIUS CLEMENTIANUS (c.530-c.600). Bishop of Poitiers, and chief Latin poet of his time. He was born at Ceneda, near Treviso, and studied at Ravenna. After traveling through Germany and France he took up his residence at the Court of Sigbert, King of Austrasia, where he wrote an epithalamium to celebrate the King's marriage with Brunhilda. He again took up the wandering life, but finally settled at Poitiers, where he was brought into association with Radegunda, wife of Clotaire II., who was living there in retirement in a convent which she had founded, and also met Gregory of Tours and other eminent ecclesiastics. He became a priest, and in 599 was chosen Bishop of Poitiers. Fortunatus wrote hymns, epitaphs, poetical epistles, verses in honor of his patrons, and descriptions of events in his life. He also wrote a life of Saint Martin of Tours and several other lives of saints. His hymn, *Vexilla regis prodeunt* ('The royal banners forward go'), is well known in the English translation by J. M. Neale. His works are in Migne, *Patrol. Lat.*, lxxxviii.; the best edition is by Leo and Krusch (Berlin, 1881-85). For his life consult: Leroux (Paris, 1885) and Nisard (Paris, 1880).

FORTUNE. A poem attributed by John Shirley to Chaucer. It first appeared in a set of poems brought together by the latter, the manuscripts of which are now in the Harleian Collection in the British Museum. The sources of the poem were partly Boëthius and partly the *Roman de la Rose*. It is described in the subtitle as "The Face of the World as it really is, not painted."

FORTUNE. A painting by Guido Reni, representing the Goddess of Fortune undraped, moving over a globe, and scattering money from a purse, while a cupid clings to her flowing hair and scarf. The painting is in the Accademia di San Luca, Rome.

FORTUNE, THE. A play-house which once stood near Blackfriars Bridge, London, close upon the site of the ancient Monastery of the Black Friars. It was first erected in 1599 by Philip Henslowe and Edward Alleyne, and occupied by the Lord Admiral's Company. It was originally of wood, was burned down in 1621, was rebuilt in brick, and was torn down by the Puritans in 1649.

FORTUNE, TEMPLE OF. One of the most ancient extant temples of Rome, and one of the best preserved, in the Forum Boarium, near the Æmilian Bridge. It was erected by Servius Tullius, and was rebuilt in the third century B.C. In the ninth century A.D. the spaces between the columns were walled up and the edifice became the Church of Santa Maria Epiziaca. The temple is remarkable for its pure Ionic architecture, and for the absence of marble in its construction. The exterior was covered with painted stucco. It contained a wooden statue, draped in a toga, which Pliny says lasted until the time of Tiberius. The popular name of the temple, *Fortuna Virilis*, is probably due to a mistranslation of its original title, *Templum Fortis Fortunæ*, in which Fortis was the genitive of *fors*, not of the adjective *fortis*.

FORTUNE, ROBERT (1813-80). An English botanist and traveler. After receiving a common school education he was employed in the Edinburgh Botanical Gardens, and at the conclusion of the Chinese War in 1842 he was sent to collect plants in northern China by the Royal Horticultural Society. His second journey to China in 1848, in the interests of the East India Company, like the first, gave to Europe many of the beautiful flowers of the Far East, and also resulted in the introduction of the tea shrub into India, where formidable competition with China in the production of tea immediately began. A third expedition included Formosa and Japan; and in 1857 Fortune again visited China to collect seeds of the tea shrub for the United States Patent Office. His published works include: *Three Years' Wanderings in the Northern Provinces of China* (1847); *Report upon the Tea Plantations in the Northwest Provinces* (1851); *A Journey to the Tea Countries of China* (1852); *Two Visits to the Tea Countries of China* (1853); *A Residence Among the Chinese* (1857); *Yeddo and Peking: A Narrative of a Journey to the Capitals of Japan and China* (1863).

FORTUNES OF MOLL FLANDERS, THE. A novel by Defoe (1722), the story of a harlot, thief, and convict, who finally reforms.

FORTUNES OF NIGEL, THE. An historical novel by Walter Scott (1822). The scene is laid in London, and gives a vivid sketch of life in that city in the early years of the seventeenth century.

FORTUNE-TELLING. The telling of fortunes, whether by the arts of astrology, palmistry, or other forms of divination, was not an offense at the common law. But by the English Vagrancy Act of 1824 (5 George IV., c. 83) any person who pretends to tell fortunes or practice palmistry is liable to summary punishment by imprisonment as a rogue and a vagabond. Modern statutes in this country generally class those 'pretending to tell fortunes' as disorderly persons, and provide for their arrest and summary examination.

FORTUNIO. The daughter of an octogenarian lord, who in disguise goes as her father's substitute when he is summoned for military service. With the aid of resources granted her by a fairy, she accomplishes many wonderful feats. The character appears in many fairy tales, ancient and modern.

FORTUNY Y CARBO, för-tōō'nē ē kär'bō, (1839-74). A Spanish painter and etcher. He was born at Réus, in Catalonia, June 11, 1839. He studied at the academy at Barcelona, under Claudio Lorenzalez, and received inspiration from lithographs of Gavarni. Afterwards he turned for his motives directly to nature. In 1856 he won a school prize, which enabled him to study at Rome. During the Spanish war against Morocco (1859-60), he was on the staff of General Prim, and was completely absorbed in sketching those Oriental scenes which appealed most strongly to his nature. With a view of copying the Spanish masters he went, in 1865, to Madrid, where he fell somewhat under the influence of Goya. There he made the acquaintance of Madrazo, whose daughter he married. In 1866 he visited Paris and received from the art dealer Goupil commissions which placed him above want, and soon after he settled in Rome. Henceforth he devoted himself to kaleidoscopic pictures of the Rococo period, which became his special province. His studio in Rome was a salon in which men of letters, artists, and many brilliant members of the social world were wont to congregate. He was forced by ill health to leave Rome for a while, but in 1874 returned to that city, suffered a relapse, and died October 21st of that year. His canvases were usually small in dimensions, but filled with multitudinous details painted with great freedom, skill, and vivacity of colors. He was very successful in dazzling sunlight effects. The city hall of Barcelona contains several of his paintings, notably the "Battle of Tetuan," considered one of his finest works, although unfortunately not finished. The sketch for this is in the Museo de Arte Moderno at Madrid, which also contains "Queen-Regent Maria Christina and Her Daughter Inspiring the Government Troops."

His work is to-day the dominating influence in Spanish art, in so far as it is individual, and has influenced the French school as well. Of his Oriental subjects, the best-known are the "Praying Arab," "Fantasy of Morocco" (1866), "Tribunal of a Cadi," and, especially, the "Snake Charmers," which he duplicated. His most cele-

brated Rococo picture is the "Spanish Marriage" ("La Vicaria," 1869), containing portraits of the painter Regnault (q.v.), Madame Fortuny, and other friends. Others are the "Trial of the Model," the "Poet," the "Rehearsal," the "China Vase." There is a large number of his works in America, both in public and private possession. Among these are three good examples: "An Ecclesiastic," "Don Quixote," and the "Mendicant," in the Waters Collection, Baltimore, and a portrait of a "Lady in Black," in the Metropolitan Museum, New York. Others of his most widely admired creations are "Hindoo Snake-Charmers," in the Walters Collection, Baltimore; "Wedding in the Vicaria at Madrid," "The Butterfly," and "Academicians Choosing a Model." One of his Oriental subjects, "Camels at Rest," is in the Metropolitan Museum, New York.

Fortuny was also an aquarellist of note, and a brilliant etcher, his works resembling those of Goya. Like him, he uses as a background the aquatint, and the outlines of his figures are drawn with light and spirited strokes. Some of his chief etchings are the "Dead Arab," the "Shepherd," the "Reader," the "Pensioner," the "Anchorite," the "Arab Mourning." Consult the biographies of Fortuny by Davillier (Paris, 1875) and Yriarte, in *Les artistes célèbres* (ib., 1885). See also the *Fortuny Album*, published by Goupil (ib., 1889); Bell, *Representative Painters of the Nineteenth Century* (New York, 1899); Muther, *History of Modern Painting*, vol. iii. (London, 1896).

FORT WADSWORTH. A United States military post, established in 1827, and occupying a reservation of 221 acres on Staten Island, N. Y., commanding 'the Narrows.' The post-office is Rosebank, N. Y., while the telegraph station is Quarantine, Clifton, S. I. It was named for Gen. J. S. Wadsworth, who was killed in the battle of the Wilderness (1864).

FORT WALLA WALLA, wōl'la wōl'la. A United States military post, established in 1857, and occupying a reservation of 612 acres, one mile from Walla Walla, Wash., which is the post-office, telegraph, and railroad station. Its garrison consists of two companies of field artillery.

FORT WARREN. A United States military post, established in 1837, and occupying a reservation 28 acres in extent on Georges Island, 7¼ miles southeast of Boston, Mass. The post was first occupied in 1861, and during the Civil War was used as a military prison. The post-office and telegraph station is Boston, Mass. The garrison comprises two companies of artillery.

FORT WASHINGTON, An important military post during the American Revolution, occupying the highest part of Manhattan Island, and covering the ground overlooking the Hudson between the present 181st and 182d Streets, New York. It was surrendered to the English under Sir William Howe on November 16, 1776. After the battle of White Plains (q.v.), Washington crossed over to New Jersey, but against his better judgment, left a considerable force under Colonel Magaw in Fort Washington. Howe invested the fort on November 15th, and commanded the garrison to surrender on pain of being put to the sword. Magaw replied that he would defend the place to the last

extremity. The next day the British attacked in four divisions, led respectively by General Knyphausen and General Matthews (supported by Lord Cornwallis), Lieutenant-Colonel Sterling and Lord Percy. Soon after daybreak the cannonading began, and it continued with great fury on each side until noon. Knyphausen's Hessians then advanced in two columns, one of which, under General Rahl, ascending circuitously to the summit of the hill, penetrated Magaw's advanced works, while the other ascended the hill in a direct line, suffering much on the way from the well-directed fire of Colonel Rawling's riflemen. The second division made good their landing, forced the opposing Americans from their sheltering rocks and trees up a steep and rugged hill; while the third, landing under a heavy fire, succeeded, after a stubborn fight, in carrying an advanced redoubt. Percy's division, with conspicuous gallantry, carried other advanced works. On a second summons from Howe, Magaw, seeing the uselessness of further resistance, surrendered the fort, his troops (2600 in number) becoming prisoners of war. The American loss in killed and wounded was 130; the British, 454. The English had been materially assisted by the treason of one of Magaw's officers, William Demont, who, on November 2d, had deserted, and furnished Howe with detailed plans of the American works. The loss of the fort caused great consternation throughout the United States, and has been regarded as, in some respects, one of the greatest military misfortunes of the Americans during the war, the garrison representing the flower of Washington's army. Consult: De Lancey, *The Capture of Fort Washington, the Result of Treason* (New York, 1877); Dawson, *Battles of the United States* (New York, 1858); and Carrington, *Battles of the American Revolution* (New York, 1876).

FORT WASHINGTON. A United States military post, established in 1815, and comprising a reservation of 334 acres on the left bank of the Potomac River, $1\frac{1}{2}$ miles below Washington, D. C. The garrison consists of three companies of coast artillery.

FORT WAYNE. A United States military post, established in 1842, and containing a reservation of 63 acres on the Detroit River, near the city of Detroit, which is the post-office and telegraph station. There are quarters for a battalion of infantry.

FORT WAYNE. A city and railroad centre, the county-seat of Allen County, Ind., 150 miles east by south of Chicago, Ill., at the junction of the Saint Joseph's and Saint Mary's rivers, which here unite in the Maumee, and on the Pittsburg, Fort Wayne and Chicago, the Lake Shore and Michigan Southern, the Grand Rapids and Indiana, the New York, Chicago and Saint Louis, the Wabash, the Lake Erie and Western, and the Cincinnati, Hamilton and Dayton railroads (Map: Indiana, D 1). It occupies an area of nearly 10 square miles on a plateau at an elevation of 775 feet, and has a United States Government building, a court-house that cost over \$1,000,000. Saint Joseph's and Hope hospitals, Indiana School for Feeble-Minded Youth, orphan asylums, a public-library building, for the erection of which Andrew Carnegie gave \$75,000, three public parks, and monuments to Anthony Wayne and Henry W. Lawton. It is also the seat of Concordia Col-

lege (Lutheran), opened in 1839. The city is in an agricultural district and has important manufacturing interests. The industrial plants include shops of the Pennsylvania and the Wabash railroads, foundries and machine-shops, wheel-works, flouring-mills, electric-light works, knitting-mills, oil-tank works, packing houses, shirt and waist factories, etc.

Fort Wayne is governed by a mayor, who holds office for four years, and a unicameral council. Of the municipal officials, the boards of health, public works, and public safety are appointed by the mayor and confirmed by the council. The annual income of the city, including revenues of water-works, amounts to about \$650,000, expenditures to \$475,000, the principal items of expense being \$30,000 for the police department (including amounts for police courts, jails, etc.), \$50,000 for the fire department, and \$100,000 for schools. The water-works, which are owned by the city, are operated at a yearly cost of about \$40,000. Fort Wayne is built on the site of the principal village of the Miami Indians and near the site of the old French Fort Miami. In October, 1790, General Harmar burned the village. In 1794 Gen. Anthony Wayne built a fort here which, in September of 1812, was closely besieged by the Indians. A village gradually grew up and was chartered as a city in 1839, though growth of the place was very slow until after the completion of the Wabash and Erie Canal in 1840, and of several railroads between 1850 and 1860. Population, in 1850, 4282; in 1870, 17,718; in 1890, 35,393; in 1900, 45,115.

FORT WILLIAM. A town in Algoma District, Ontario, Canada, on the Kaministiquia River, near Lake Superior (Map: Ontario, L 8). It is an important landing-place for lake steamboats and the terminal station of the east division of the Canadian Pacific Railroad. It has grain-elevators in connection with an important shipping trade, and is a favorite summer resort for boating, fishing, and shooting. It is picturesquely situated at the foot of McKay Mountain, and was founded by the Hudson Bay Company in 1801; their old fort is now a powerhouse. The United States is represented by a consular agent. Population, in 1891, 3000; in 1901, 3633.

FORT WILLIAM. See CALCUTTA.

FORT WILLIAM HENRY. A fort erected in 1755 by Sir William Johnson (q.v.) on the site of the present Caldwell, N. Y., at the head of Lake George. During the early part of the French and Indian War it was an important strategic position, and was the starting-point for many minor expeditions against the French and Indians. Rigaud, at the head of a considerable French force, made a half-hearted and unsuccessful attack upon it in the spring of 1757 (March 18-23), and later in the year Montcalm marched against it at the head of a force of about 8000, including 2000 Indians. On August 2d he demanded the surrender of the fort, then garrisoned by about 2200 men, and on the refusal of Colonel Munro, the commanding officer, began a vigorous attack. Although Colonel Webb was stationed at Fort Edward, only fifteen miles away, with an English and colonial force of 1600, Colonel Munro was not reinforced, and on the 9th was compelled to surrender. Montcalm agreeing that the garrison should march out with the honors

of war, and should be escorted to Fort Edward by a detachment of French regulars. Early on the 10th the survivors began their march, but were soon set upon by the Indians, and a general massacre ensued, an unknown number of the troops being killed outright, and many more being carried into captivity. Though this attack was not instigated by the French, contemporary evidence seems to show that no earnest effort was made by them to force the Indians to observe the treaty stipulations. Cooper used this incident in his *Last of the Mohicans*. Consult Parkman, *Montcalm and Wolfe* (Boston, 1884).

FORT WORTH. A city and the county-seat of Tarrant County, Texas, 30 miles west of Dallas; on Trinity River, and on the Gulf, Colorado and Santa Fé, the Texas and Pacific, the Chicago, Rock Island and Pacific, the Fort Worth and Denver, the Fort Worth and Rio Grande, and other railroads (Map: Texas, F 3). It is the seat of Fort Worth University (Methodist Episcopal) founded in 1881, Polytechnic College (Methodist Episcopal, South) opened in 1891, and the Fort Worth Medical College. Among the finest structures in the city are the Carnegie Public Library, railroad depots, post-office, city hall, and county court-house. Fort Worth has an annual trade valued at \$30,000,000; it is the centre of a vast stock-raising country, and is an important cotton market. The industrial establishments include stock-yards, packing houses, grain-elevators, flour-mills, tanneries, breweries, railroad repair-shops, foundries and machine-shops, cotton and oil mills, etc. Settled in 1849, Fort Worth was incorporated in 1872. The government is administered under a charter of 1900, by a mayor elected biennially, and a council which controls the appointments to most of the subordinate municipal offices. The city owns and operates its water-works and electric-light plant. Population, in 1880, 6663; in 1890, 23,076; in 1900, 26,688.

FORT YELLOWSTONE. A United States military post, established in 1886, and formerly Camp Sheridan (1874). The reservation comprises 28 acres on Beaver Creek, and is eight miles from Cinnabar on the Northern Pacific Railroad, within the limits of Yellowstone National Park. The post-office and telegraph station (June to October) is Mammoth Hot Springs, near the post; and telegraph station (October to May) Cinnabar, Mont. The garrison is one company of cavalry, and has charge of the Yellowstone National Park.

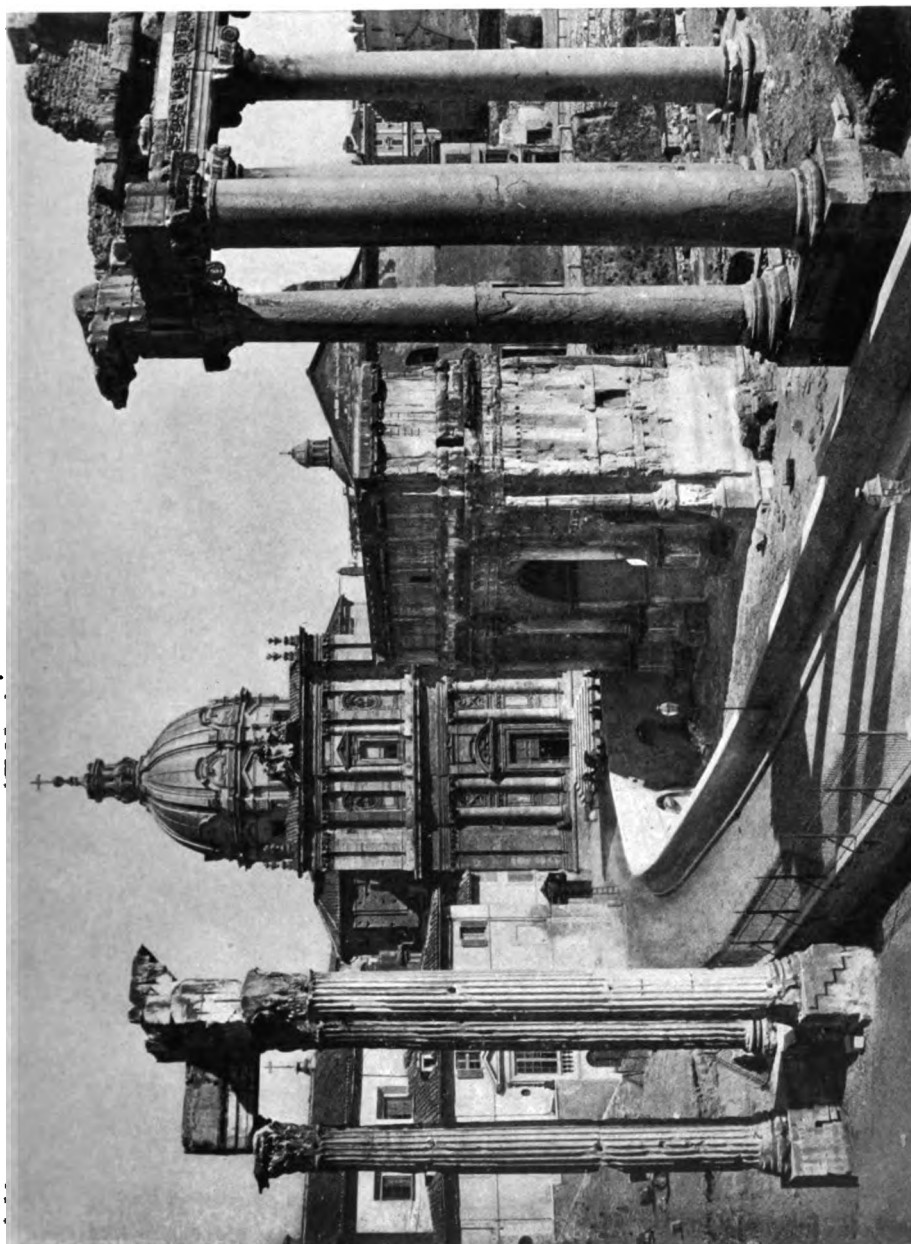
FORTY-NINERS. A name popularly applied to the throng of fortune-seekers who emigrated to California in the years immediately following the discovery of gold there in 1848, especially to those who went during the period of greatest excitement in 1849. They were also called 'Argonauts.' They came, some by land and some by sea, from all parts of the world, and had among them representatives of almost every nationality, of every color, and of every social stratum. Those who came by sea embarked, for the most part, from ports in the Eastern States, some making the long and dangerous voyage around Cape Horn, and others proceeding to Chagres, and thence across the Isthmus to Panama, where they again embarked on any vessel obtainable. The chief carriers were the three side-wheelers, the *California*, the *Oregon*, and the *Panama*,

of the Pacific Mail Steamship Company, which frequently transported more than three or four times the number of passengers for which they were designed. Besides these, nondescript vessels, of every size and kind, were commissioned for the service, and were likewise greatly overcrowded, while many reckless adventurers, unable to force their way aboard, left for their destination in clumsy Indian dug-outs. Much as passengers by the sea suffered, however, overland travelers suffered even more. The majority of these gathered from May to June of each year at Independence or Saint Joseph, Mo., at that time on the frontiers of civilization, and then proceeded to Sacramento in long caravans, continually harassed on the way by the Indians, and forced to suffer terribly from starvation, exposure, and fatigue. The first emigrant train reached Sacramento in August, 1849, and others followed in quick succession. By the end of 1849 it is estimated that 42,000 emigrants had arrived by land, and 30,000 by sea. Consult: Bancroft, *History of the Pacific States*, vol. xviii. (San Francisco, 1888), and ib., *California Inter-Pocula* (San Francisco, 1888); Bayard Taylor, *El Dorado* (New York, 1862); Stillman, *Seeking the Golden Fleece* (San Francisco, 1877); and Bret Harte, *Tales of the Argonauts* (Boston, 1875).

FORTY THIEVES, THE. A band of robbers, in the tale of "Ali Baba," in the ordinary translations of the *Thousand and One Nights*, although not found in the best Arabic manuscripts. They dwelt in a cave in the forest, the door of which opened only in response to the words 'Open, sesame.'

FORUM (Lat., market-place; connected with *foris*, door). The term applied by the Romans to the large open space in the central part of any city, which was the common resort of the people for business and pleasure. It was the political centre, where the magistrates and people met, and where elections were held; here were the administrative and civic buildings or inclosures, such as the *comitium*, with its tribunals and rostra for the large assembly; the *curia* or senate-house, temples, treasuries, and basilicas, or law courts. At each end of the road or roads crossing the fora were often archways, or *Jani*, used as resorts for merchants and scribes. The other buildings bounded the forum on different sides, and between them were shops or *tabernæ* belonging to the different trades.

HISTORIC EVOLUTION. In the early days of the Royal and Republican ages, there appears to have been but a single forum in each city, serving not only for political, legal, and mercantile purposes, but also for the popular games and amusements—the theatrical shows, wild-beast contests, gladiatorial fights, and races. The old Roman Forum and all those modeled upon it, like that of Sinuessa, were of this type. The next stage was the distinction into two fora, one devoted to law, administration, and politics, and the other to the sale of commodities. This was due, perhaps, to the influence of Greece, where there were often two agoras of this description—as at Athens. The Greek agoras were microcosms of the city, filled with tents, shops, and benches, surrounded by special buildings, and with bazaars in the connecting streets; here laborers were hired, slaves bought, and all business transacted. Until a few decades ago the plan and buildings of



THE ROMAN FORUM
SHOWING THE COLUMNS OF THE TEMPLE OF SATURN (RIGHT), THE ARCH OF SEPTIMIUS SEVERUS, THE CHURCH OF SS. MARTINA E LUCA, AND THE COLUMNS OF THE TEMPLE OF VESPASIAN

such Greek squares were hardly known at all, except for Pausanias's description of those at Athens, Megalopolis, Corinth, Messene, Elatea, Sparta, and Elis; but a number have recently been excavated or investigated with great success, not only in Greece, but in Asia Minor, especially at Priene, Miletus, Side, Termessus, Aphrodisias, Antiphellus, Pessinus, and Cnidus. It is not possible to compare closely these Greek agoras with the Roman fora. The differences are due, not merely to the very different schemes of administration, but to the great importance given to law by the Romans, which finally made of the basilicas the great factor in the administrative fora.

THE DIFFERENT FORA. The third stage, however, in the differentiation of the fora, had been reached before the basilicas (q.v.) had attained this importance; it was through the establishment of a separate forum for the sale of each important commodity. There were one or more cattle or meat markets (*forum boarium*, *forum saurium*, *forum pecuarium*), for horned cattle, pigs, and sheep; a fish-market (*forum piscarium*); a wine-market (*forum vinarium*); a vegetable-market (*forum olitorium*); a grain-market (*forum pistorium*). Less space was required for the trades, such as goldsmiths, saddlers, glaziers, money-changers, dry-goods merchants, blacksmiths, tinmiths, etc., and they occupied shops around these separate squares, or on streets leading from them. There were evidently sometimes covered markets, such as cloth-markets, like that of Pompeii. The city theatre often adjoined the forum, as at Ostia and Timgad; so did the circus and amphitheatre in many cases. The temples of the forum often served more than a religious purpose: in Rome the Temple of Concord served for meetings of the Senate, and that of Saturn was at one time the State Treasury, and even the public archives until the erection of the Tabularium (q.v.). In many Imperial Roman cities there was a *Capitolium* in connection with the forum, a triple temple in imitation of the Temple of Jupiter (Juno and Minerva), as at Susestula. Of the fora outside of Italy, those of the cities of North Africa are the most interesting and direct imitations, and their ruins are numerous and untouched. The most important is at Thamugadi (Timgad), like so many other African cities, a military colony. It had its two triumphal arches at each end of its main road, its temples, curia, scholæ of the corporations, tribunal and rostra, basilica and colonnades inclosing the square.

The fora at Pompeii are also well preserved. They were: The *forum triangulare* to the south, with the Doric Greek temple, a colonnade on two sides, and an Ionic portico at the entrance; the principal forum, about 450 feet from north to south, with the Temple of Jupiter, flanked by a memorial arch on each side, formerly the main entrance, on the north, with the three *curiæ* or tribunals, occupying the south end, with the Basilica and the Temple of Apollo on the west, and the *macellum* or market, the 'Senaculum,' the Temple of the Genius of Augustus, and the Scholæ or corporation building on the east side, and near by the building of the Eumachia, or cloth-market.

The open spaces in all the fora were so filled with honorary statues even as early as the Republican period, as well as with altars, arches,

wells, memorial columns, etc., that it was necessary at times in the Roman forum to order a wholesale removal of them. The fora of Rome were naturally in a class by themselves, although in the fourth century A.D. those of the new Imperial capital, Constantinople, were made almost to rival them in number and wealth of artistic decoration by the Emperors from Constantine to Honorius.

THE FORUM ROMANUM. The original Roman Forum (*Forum Romanum Magnum*) occupied the lowlands between the Palatine, Capitoline, and Quirinal hills, and served as political and commercial common ground for the separate tribes inhabiting these different hills, as well as those on the Caelian and Esquiline, before the closer union under the Tarquins when Rome became one city. Then the Forum took a more regular and monumental shape, and was underdrained and surrounded by shops. The temples of Saturn (B.C. 497), of the Dioscuri (B.C. 484), and of Concord (B.C. 367) added substantially to its beauty, but it was not until quite late (B.C. 184) that the first court-house, the Basilica Porcia, was built, to be followed by the Fulvia (Æmilia), Sempronia, and Opimia, giving to the Forum the characteristic colonnaded effect that was imitated in other cities. This crowding of the open space with buildings and honorary monuments, and the increasing importance of the political aspect of the Forum (being the place of meeting of people and Senate), as well as its legal aspect, led to the relegation to a separate market of the malodorous fish-mongers' stalls (*forum piscatorium*), and this example was followed for the other venders, as explained above. Even this failed to give sufficient room for the rapidly expanding political-judicial life of the city, and in B.C. 54 a new era was commenced by the construction of the Æmilian basilica, in pursuance of a scheme carried forward by Julius Cæsar, who began the addition of the special fora.

IMPERIAL FORA. The Forum Julium was followed by Augustus with his Forum Augustum or Forum Martis, by Vespasian with his Forum Pacis, by Domitian and Nerva with the Forum Transitorium, and finally by Trajan with his magnificent Forum Traiani, the most superb architectural group in Rome—all communicating with the Forum Romanum in a continuous line to the north and east of it. Of these, the Julian Forum was in the form of a sacred inclosure, around a temple of Venus Genetrix, Cæsar's patroness; the Augustan, dedicated to Mars, was an inclosure ending in the Temple of Mars Ultor, flanked by two triumphal arches, and intended to be an heroum, filled with a gallery of statues of great Romans who had extended the boundaries of Roman power; the Forum of Nerva was dedicated to Minerva, and besides her temple contained the main thoroughfare of this part of the city, which gave it the name Transitorium. Finally, the Forum of Trajan had its own special basilica (*Basilica Ulpia*), like the great Forum: it was entered through a colossal triumphal arch leading to the open square of the forum surrounded by a double colonnade, with the Emperor's equestrian statue in the centre, and flanked by a large hemicycle on each side. Then came the Basilica Ulpia, also with two end hemicycles, and a double two-storied colonnade, the double Library with the Memorial Column in the intermediate area, and, finally, the Temple of

Trajan, erected by Hadrian. The importance of this forum was increased by the fact that it took the place of the hill connecting the Capitoline and Quirinal, and so for the first time established an adequate connection between the two sections of the city on either side of the Capitoline Hill. As for the Roman Forum itself, its decoration was continued to the latest days of the Empire, many honorary statues being set up and buildings repaired during the fourth century. Its appearance at that time was about as follows: Backing against the Capitol were the temples of Concord, of Vespasian, and the Dii Consentes, while the Temple of Saturn occupied the space between the ascent to the Capitol and the Vicus Jugarius, where the Arch of Tiberius also stood, across the forum facing the Arch of Septimius Severus, with the Rostra between them. Beyond the Arch of Severus were the political buildings, the Curia or Senate-house, and its annexes, on the Comitium, the other buildings on the north side being the Temple of Janus and the Basilica Æmilia. On the opposite (south) side was the great Basilica Julia, occupying the space between the Vicus Jugarius and the Vicus Tusculus, and the Temple of Castor (Dioscuri)—one of the most exquisite works of Roman architecture. The centre of the open space is here occupied by the Temple of Julius, flanked by a triumphal arch of Augustus. Continuing eastward we reach the primitive religious centre of this region, the Regia and the Shrine of Vesta with its atrium opposite, which are the Temple of Antoninus and Faustina and the Templum Urbis. Here anciently stood the Arch of the Fabii, originally the entrance to the Via Sacra.

LATER HISTORY. The topography and monuments of the Forum appear to have suffered but slight damage from the barbarian invasions of the fifth century, and it was not until the ninth century that its ruin was noticeable, accompanied by a rise in its level. It was the fire of 1084, when Guiscard captured the city, which gave the old buildings their death blow, and buried them partly out of sight, the more conspicuous being occupied as feudal fortresses, and the level spaces turned into gardens. The Renaissance combined, with its antiquarian curiosity, a destructive vandalism which was more fatal to the Forum and the monuments surrounding it than any previous disasters, especially under Paul III. (1534-49). The area became waste land, in which stood a few melancholy columns. It was called the Campo Vaccino. The destruction stopped only at the beginning of the nineteenth century under Pius VII. and his antiquarian Fea, and excavations have been carried on almost continuously ever since then. It is to be regretted that they have not been conducted in an absolutely scientific manner until those of recent years under Boni (whose admirable methods deserve high praise), and resulted until then in the destruction of many landmarks. Much remains to be done, especially in the region of the Basilica Æmilia and in the lower strata of the Republican and Royal periods.

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Nichols, *The Roman Forum* (London, 1877), and the various publications of Lanciani and Hülsen, especially Lanciani, *Ruins and Excavations of Ancient Rome* (Boston, 1897), as well as the recent handy guide of Marucchi, *Le Forum Romain* (Rome, 1901 et seq.). Hülsen has published a restoration of the Forum (in *Das Forum Romanum*, Rome, 1892), and with Kiepert a plan in *Formæ Urbis Romæ Antiquæ* (Berlin, 1896), while Lanciani, *Forma Urbis Romæ* (Milan, 1901), gives the ancient plan on a larger scale and by different methods. The inscriptions of the Forum are given in the *Corpus Inscriptionum Latinarum*, vol. vi. (Berlin, 1893); the best photographs are by Anderson and Alinari. An early detailed restoration, Canina, *Gli edifizii di Roma Antica* (Rome, 1848-56), is spectacular but unreliable; Dutert, *Le Forum Romain* (Paris, 1876), is far preferable. The official report of Boni is to be found in *Notizie degli scavi* (Rome, 1899 et seq.).

FORUM. In law, a court, or a place of jurisdiction. It is used by Blackstone in the first sense, when he speaks of leaving a person to his "common remedy in *foro contentiosis*"—in a court of litigation, that is in an ordinary court of justice. Judges sometimes refer to a domestic court as *forum domesticum*. The term is used in a similar sense when an advocate is described as eminent or successful in the forum. It is more frequently employed in the second sense, as a place of jurisdiction. It bears this signification in Kent's commentaries. "In respect to remedies," writes the Chancellor, "there are properly speaking three places of jurisdiction: (1) The place of domicile of the defendant, commonly called the *forum domicilii*; (2) the place where the thing in controversy is situate, commonly called the *forum rei sitæ*; (3) the place where the contract is made, or the act done, commonly called the *forum rei gestæ* or the *forum contractus*." When it is said that a question is to be determined by the *lex fori*, it is meant that the decision is to be in accordance with the law of the jurisdiction within which the action is brought. (See **CONFLICT OF LAWS**.) The employment of the term in these and similar significations is due to the fact that Roman courts of justice were held in or near the Forum. Consult Forsyth, *Hortensius the Advocate*, ch. iii. (Jersey City, 1881).

FORUM APPII. A town on the famous Appian Way (q.v.); the modern Foro Appio, 43 Roman miles from Rome. Here a canal began which ran southward parallel with the Appian Way to within a short distance of Terracina. Horace (*Satires* i., 2 sqq.) has an amusing description of the place as "abounding in boatmen and wretched inns." Here travelers might, if they preferred, change from the road to the canal-boat. This was Horace's choice, much to his discomfort. At this place, Paul, on his journey to Rome, being met by brethren of the Roman Church, 'thanked God and took courage' (Acts xxviii. 15).

FORUM BOA'RIMUM. The ancient cattle-market of Rome, situated between the Velabrum and the Tiber; on its side stands the elegant circular Temple of Hercules (?), popularly called the Temple of Vesta.

FORUM JULIUM, or FORUM OF CÆSAR. The first of the five Imperial fora at Rome. It

was built by Cæsar from the spoils of the Gallic war, on ground to the northeast of the Forum Romanum, for which \$4,000,000 was paid. It was surrounded by arcades and contained the magnificent temple of Venus Genetrix. Nothing now remains of its buildings but some half-buried arches.

FORUM OF AUGUSTUS. See AUGUSTUS, FORUM OF.

FORUM OF NERVA. See NERVA, FORUM OF.

FORUM OF TRAJAN. See TRAJAN, FORUM OF.

FORUM OL'ITO'R'IUM (Lat., vegetable market). The vegetable market of Rome, adjoining the Forum Boarium. The space contained several temples, of which some remains are preserved.

FORUM PA'CIS (Lat., Forum of Peace), or **FORUM OF VESPA'SIAN.** The third of the Imperial fora at Rome, built to inclose Vespasian's Temple of Peace, called by Pliny one of the three most magnificent buildings in Rome. In it were dedicated the spoils taken from Jerusalem. There are no remains of the temple. This forum was separated from the Forum of Augustus by a wide street leading from the Subura to the Forum Romanum. This strip later became the Forum Transitorium of Nerva.

FORUM ROMA'NUM. See FORUM.

FORUM TRAN'SITO'R'IUM. See NERVA, FORUM OF.

FORWARD, WALTER (1786-1852). An American lawyer and Cabinet officer, born in Hartford County, Conn. In 1803 he removed to Pittsburg, Pa., where for some time he was an editor of the Democratic newspaper, the *Tree of Liberty*. He then studied law, was admitted to the bar in 1806, and for some time combined both law and journalism. In 1822 he was elected to Congress as a Democrat, to fill a vacancy, and in 1823 took his seat for a full term, to serve until 1825. During this time he became associated with the followers of John Quincy Adams, whom he supported for the Presidency. Thenceforth his affiliations were with the Whigs. He was a leading member of the Protectionist Convention at Harrisburg in 1827, was active in the Pennsylvania Constitutional Convention in 1837, and in 1841 was appointed by President Harrison First Comptroller of the Treasury. After the death of Harrison and the subsequent resignation of his Cabinet, Forward was appointed by President Tyler, in September, 1841, as Secretary of the Treasury; but as Tyler broke away more and more from the Whigs, his position became more difficult, and finally, in March, 1843, he resigned. From 1843 to 1849 he practiced his profession at Pittsburg; from 1849 to 1851, by appointment of President Taylor, was chargé d'affaires at Copenhagen, Denmark, and from 1851 to his death was president judge of the Allegheny County District Court.

FORWARDING. The business of receiving and transmitting goods. The forwarding merchant assumes the expense of transportation, and receives compensation from the owners. Such a person is not deemed a common carrier, but is merely a warehouseman or agent, and is required only to use ordinary diligence in sending the property by responsible persons, and to obey the in-

structions of his principal. Forwarding merchants have in the United States been superseded largely by express companies. Common carriers often act as forwarders of goods from points on their own line to other places. A person who holds himself out as a public forwarder is under a legal duty to receive and forward all goods tendered to him by any person for a reasonable compensation, unless he can show a valid excuse for his refusal or failure so to do. See CARRIER, COMMON.

FOSCARI, fôs'kà-rê, FRANCESCO (1372-1457). Doge of Venice from 1423 to 1457. Previous to his election he had acquired considerable reputation as the guardian of the young Marquis of Mantua, and as one of the procurators of San Marco. He was always an advocate of an aggressive policy on the Italian mainland, for the purposes of territorial aggrandizement, and he was elected to the Dogate as an exponent of such a policy. He soon entered upon a course of conquest, which continued, with intervals of peace, for nearly thirty years, and which, in spite of many defeats, resulted in the reduction of a large part of northern Italy under Venetian rule. In 1426-27, in league with Florence, Naples, Savoy, and many minor principalities, he carried on a conflict with the Visconti of Milan. As a result, Venice acquired the towns of Bergamo, Cremona, and Brescia. War broke out again in 1431; the Venetian forces suffered defeat; but in the treaty of peace the territories of the Republic were nevertheless extended to the Adda. Two years later hostilities were recommenced; this time Venice, Florence, Genoa, and the Pope were arrayed against Milan, Mantua, and Naples, and by the peace signed in 1441 Venice gained possession of Peschiera and other places. Hostilities were finally terminated by the Peace of Lodi, in 1454. In spite of his uniform success in Italy, Foscari was forced to meet bitter opposition at home. This was based mainly on the fact that, owing to the Italian wars, the influence of Venice had suffered greatly at the hands of the Turks in Greece and in the Grecian Archipelago. This opposition took the form of a cruel persecution of Foscari's youngest son, Giacopo, who, with his father, forms the subject of Byron's tragedy *The Two Foscari*. In 1444 Giacopo was denounced for having received bribes in order to use his influence in the disposal of State offices. He was tried by the Council of Ten and banished; but in 1447, on the Doge's petition, he was allowed to return, and he lived quietly at Venice for three years. In 1450 one of the Council of Ten was murdered, and suspicion fell upon Giacopo, who in the following year was tried, tortured, and banished to Candia, the Doge taking no part in the trial. There was great doubt about Giacopo's guilt, though he seems to have engaged in treasonable correspondence. He was again recalled, tried, and again banished. There was still so much uncertainty about his guilt that a movement to recall him had almost succeeded when his death was announced, in 1457. Foscari, worn out and broken-hearted, was soon after deposed illegally by the Council of Ten, through the machinations of his enemy, the Admiral Giacopo Loredano, who had been the chief instigator in the relentless persecution of the younger Foscari. He resisted at first, but yielded to force, and left the Doge's palace on Octo-

ber 24, 1457. He died on November 1st. Consult Brown, *Venice* (New York, 1893).

FOSCO, COUNT. A corpulent villain in Wilkie Collins's *Woman in White*. He combines fiendish relentlessness in the pursuit of his designs with a gentle tenderness for pet canaries.

FOSCOLO, fós'kò-lò, Ugo (1778-1827). An Italian writer, born at Zante, in the Ionian Isles, the son of a Venetian family then settled there. Originally called Niccolò, he early changed his name to Ugo. Part of his childhood was spent in Dalmatia with his father, a physician practicing at Spalato, and when this parent died he returned to Zante, whence, probably in 1793, he went to Venice. His education was continued in this city, and he made occasional visits to the University of Padua, but does not seem to have regularly matriculated there. With 1795 began his multitudinous love affairs (consult Chiarini, *Gli amori di Ugo Foscolo, etc.*, Bologna, 1892), an account of which could only bring out his inordinate vanity and fickleness. Fired with patriotic fervor, Foscolo served as an officer in armies of the several ephemeral Italian republics from 1796 on. To the period between 1799 and 1803 belong two of his best odes, those entitled "Luigia Pallavicini caduta da cavallo" and "All' amica risanata." He served in France, with the Italian division of the French Army, from 1804 to 1806, and spent some time at Boulogne-sur-Mer and at Valenciennes, where his natural daughter Floriana was borne to him by an English mother. Back in Italy in 1806, he was appointed to the chair of eloquence at the University of Pavia in 1808, and there he pronounced his inaugural discourse, "Dell' origine e dell' uffizio della letteratura," metaphysical in conception, but highly finished in form. He lost his post before long, when the chair of eloquence was abolished in all the Italian universities, and from that time on his life was marked by many vicissitudes and much suffering. A classical tragedy of his, the *Ajace*, was performed at Milan in 1811, and as it was supposed to contain some flings at Napoleon—formerly Foscolo's idol, but now his bane—the author was obliged to leave Milan. In 1813, when Napoleon's power declined, he returned to Milan, only to leave the place again when the Austrians regained control of it and his patriotic sentiments prevented him from taking the oath of allegiance to the foreigner. Self-exiled, he went to Switzerland, and then to England, where he was welcomed as a type of the fearless patriot. He lived at Kensington and in London, and in both places burdened himself with debts by his foolish lavishness. He was rescued from poverty and misery by his friend, Hudson Gurney, and died at Turnham Green. His remains were interred at Chiswick; but in 1871 the Italian Government had them transferred to Florence.

Beginning at an early date to write verses in both Italian and modern Greek, Foscolo rapidly approached excellence of composition in the former language, as is proved by the two odes mentioned above, and some exquisite sonnets produced between 1800 and 1803. *Tieste*, a youthful tragedy, was published at Venice in 1797, and was followed by the *Ajace* (1811), which was first published posthumously at Naples in 1828. Another tragedy, the *Ricciarda*, dealing with a mediæval subject, was performed at Bologna in 1813, and

published at London in 1820. The influence of Alfieri is clear in all these dramas, of which the *Ajace* alone has decided merits. By 1807 Foscolo had written his masterpiece, *I Sepolcri*, a poem of 295 hendecasyllables in blank verse, which in magnificently lyrical passages extols burial monuments as incentives to virtue and good deeds, since they commemorate those of the dead. Some of the inspiration for this work came to Foscolo from other poets. Many commentaries have been written upon it, one of the best being that of Ferrari in his school edition of the *Poesie di Ugo Foscolo* (Florence, 1891). Of *Le Grazie*, addressed to the sculptor Canova and intended to be a poetical history of art, only a fragment remains, first published by Orlandini (Florence, 1848), and since in the excellent edition of the *Poesie di Ugo Foscolo* by Chiarini (Leighorn, 1882). A passing notice may be given to the poetical *Epistola a Vincenzo Monti* (1804-06), the hymn *Alla nave delle Muse* (1806), and his numerous revisions of Greek, Latin, and French poems—as, for example, his translation of parts of the *Iliad*.

Although the *Sepolcri* is the best work of Foscolo, he owes his greatest fame to his prose works, and especially to his *Ultime lettere di Jacopo Ortis* (1798), a novel produced under the influence of Goethe's *Werther*, and unfortunate in its attitude with regard to suicide. As instances of Foscolo's well-developed critical powers, we have the inaugural discourse given at Padua, and his "Illustrazioni," furnished to an edition of the *Opere di R. Montecucoli* (Milan, 1807-09). His Italian translation of Sterne's *Sentimental Journey* was begun at Boulogne-sur-Mer. It was published under a pseudonym at Pisa in 1813, and republished in the *Hypercalypseos Didimi Clerici* (Zurich, 1815). In England he produced considerable prose. Thus, for an edition of Boccaccio's works (London, 1825) he wrote as a preface his *Discorso storico sul testo del Decamerone*, and for an edition of Dante's great poem he prepared an essay, *Sul testo della Commedia di Dante* (Brussels and London, 1842), which is a treatise of no little importance in the history of Dante studies. Foscolo also contributed articles to English magazines. Many of his letters are printed in the *Epistolaria*, prepared by Orlandini and Mayer for the edition of his works published at Florence (1850-62); others have been since edited by Tobler (Leipzig, 1871), and many more scholars.

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FOSS, CORPORAL. In George Colman's *The Poor Gentleman*, the disabled soldier, the servant of Lieutenant Worthington. The character is

based on Corporal Trim, in Sterne's *Tristram Shandy*.

FOSS, CYRUS DAVID (1834—). An American clergyman of the Methodist Episcopal Church. He was born at Kingston, N. Y.; graduated at Wesleyan University in 1854, and entered the itinerant ministry of the Methodist Episcopal Church, in the New York Conference, in 1857. From 1857 to 1859 he was a pastor at Chester, Orange County, N. Y.; from 1859 to 1865 in Brooklyn, N. Y., and from 1865 to 1875 in New York, N. Y. He was president of Wesleyan University from 1875 to 1880, and in the latter year was elected a bishop. In 1878 he was delegate to the General Conference of the Methodist Episcopal Church South, held in Atlanta, Ga., and in 1886 to the British Wesleyan Conference, held in London, England. He made tours of the missions of his Church in Europe (1886), Mexico (1893), and India and Malaysia (1897-98), and wrote *From the Himalayas to the Equator* (1899).

FOSSA, or **FOUS-SA** (Malagasy). The largest carnivorous mammal of Madagascar, a slender, lithe creature, connecting the cats and civets and in structure partaking of both. It is about twice the size of a house cat, and has a very long, tapering tail, so that it measures fully five feet from tip of nose to end of tail. It is nearly uniformly pale brown in color, with the hair short and close and no spots. Each foot has five cat-like toes, the claws of which are sharp, curved, and retractile; but the soles of the hind feet are entirely naked, and rest upon the ground in walking. The dentition is a mixture of forms characterizing both the cats and the civets, the teeth numbering thirty-six in all. A separate family has been proposed for this strange carnivore by several zoologists; but it seems best to regard it as alone representing a group *Cryptoproctinae* within the civet family (*Viverridae*), under the name *Cryptoprocta ferox*. It seems to be confined to Madagascar, where it is not numerous; and although much dreaded by the natives, on account of its reputation for ferocity and ability to do harm, is rarely seen, since it is wholly nocturnal. It feeds upon small animals and birds, and occasionally invades poultry yards; but its general habits are little known.

FOSSA MARIANA (Lat., trench of Marius). The canal made B.C. 102, by Marius, from the Rhône to the Gulf of Stomolimne, near the modern village of Foz (*Fossa Marinæ*). It was constructed to avoid the difficult navigation at the mouths of the river, caused by the accumulations of sand by the several streams. It was about 16 miles long, and was later given to the inhabitants of Massilia (Marseilles), who derived large revenues from it.

FOSSANO, fôs-sâ'nô. A city in North Italy, 1240 feet above the sea, on the left bank of the Stura, 40 miles south of Turin (Map: Italy, B 3). The name Fossano, derived from the Latin *fons sana*, indicates the presence of much-visited mineral springs. The city has promenades on the site of the old walls, a fourteenth-century cathedral, a seminary, a gymnasium, and an academy of science. It manufactures silk fabrics, gunpowder, leather, paper, and baskets. Fossano was purchased by the House of Savoy in 1340, was the residence in the sixteenth century of Philibert Emmanuel and several of his successors,

and in 1796 and 1799 was the scene of battles between the French and the Austrians. Population, in 1881, of commune, 18,000; in 1901, 18,133.

FOSSANO, AMBROGIO. See BOGGOGNONE.

FOSSIL (Fr. *fossile*, from Lat. *fossilis*, dug up, fossil, from *fodere*, to dig; connected with Corn. *bedh*, Welsh *bedd*, grave, OChurch Slav. *bosti*, Lith. *badyti*, to pierce). Any remains or trace of the form of animals or plants found buried by natural causes in deposits or rocks before the present era. The term was formerly applied to anything dug up out of the ground, and included minerals, prehistoric implements, etc. At the present day the word is used as an adjective in this latter sense, and also to designate anything pertaining to prehistoric times. Thus, we read of fossil salt, fossil rain-drops and mud-cracks, and fossil lakes, deserts, sea-beaches, and shores. The word petrification is often incorrectly employed as a synonym for fossil, although it properly designates only such organic remains as have been turned to stone, as described below. Fossils are the relics of the animals and plants that have lived upon the earth and in the waters of the earth during the long periods of its geological history, and study of their organization, occurrence, and relations to each other and to modern organisms constitutes the science of paleontology (q.v.). Fossils are naturally absent from all rocks of igneous and volcanic origin, and, on the other hand, they are present originally in nearly all rocks of sedimentary origin. From large masses of these latter they have been obliterated by chemical and physical changes, so that they are now seldom or sparingly found in metamorphic rocks. The processes by which organic remains have been preserved are grouped under the term fossilization. This includes entombment and the subsequent changes that have ensued. The place of entombment may be on land, in fresh water, or in the salt water of bays, seas, or oceans.

The degree of preservation of fossils varies greatly. In some few cases the flesh of animals has been preserved as if in an ice-box. Mammoth carcasses embedded in the frozen mud cliffs of Siberia for thousands of years had meat so fresh that it was eaten by the dogs of the exploring party. The most perfectly preserved fossils are undoubtedly those insects found in the Tertiary amber of the Baltic Provinces, where the form, structure, and colors are retained intact. Then we find shells preserved in the rocks with their original organic matter replaced by some mineral, usually silica, or perhaps barytes, pyrites, or even zinc blende. Such replacements rightly receive the name of 'petrifications.' In other cases we find cavities in rocks, the sides of these retaining impressions of the outer and inner surfaces of shells which have been dissolved and destroyed by percolating waters. These 'molds' are sometimes filled with calcite, or quartz, or other mineral matter, and then we have 'casts' of the original organic forms. The study of these molds is puzzling to the beginner, because of the multiplication of forms so caused. A single shell like a limpet, if preserved in the rocks, may present four different aspects as a fossil—the outer and inner surfaces of the shell itself, and the molds of each of these. The mold of the outer surface may pull away such delicate spines

as may ornament the shell, and for this reason molds should always be carefully collected and treated with acid, after which the impression of the original shell surface is often shown with the utmost fidelity to detail. Another class of fossils consists of the impressions or trails made by animals crawling over the bottom of the water or over the beach, and also of burrows or casts of burrows that served as dwelling-places or passageways for worms, crustaceans, etc. The study of the footprints of reptiles and supposed birds, which are so abundant on the surfaces of the Jurassic sandstones of Massachusetts and Connecticut, was named ichnology by E. Hitchcock, who described and figured a host of such impressions. Similar footprints are found in rocks of shallow-water origin of Mesozoic and Tertiary age all over the world.

The parts of animals likely to be preserved are always those that resist longest the destructive agencies that may attack them both before and after their entombment. The soft parts are seldom preserved, and often also the hard parts are destroyed. Because of this certain groups of animals are represented by insignificant parts of their anatomy, which, though of great importance to the paleontologist, are usually laid aside by the zoölogist as of trivial interest. Thus, the presence of sponges in certain formations is demonstrated by their isolated spicules; holothurians are recognized by their minute calcareous plates and anchors; worms by their teeth and dwelling-tubes; dibranchiate cephalopods by their internal shells; and many fish by their teeth, ear-bones (otoliths), spines, and dermal scales.

The manner of entombment of fossils varies greatly. In many cases the shells of mollusks have been dead a long time, and have become incrustated with polyzoans and corals before they were entombed. In other cases they were washed along the shore and broken and worn by the waves so that now in fragmentary condition they form 'shell limestones.' Among the crustacean fossils we find those that were killed suddenly, perhaps by some change in the temperature of the water, in which case their remains are usually well preserved. In some rocks of fresh-water or estuarine origin certain layers are covered with the remains of fish. These evidently lived in shallow pools that were either dried up suddenly or became so heated by the sun that the fish were killed, soon to be covered by sediment. Such conditions are frequent in the Catskill, Old Red Sandstone, and Jurassic formations. Myriads of insects of Tertiary time became entangled in the soft gum of coniferous trees, and are now preserved in the amber of the Baltic and the fossil resins of Africa and New Zealand.

The old ideas regarding fossils were curious and often fantastic. A few of the Greek and Roman philosophers had well-defined ideas of their true nature as entombed animals and plants that had once lived in the sea and upon the earth; but the majority of early writers attached to them some fanciful or supernatural origin. Thus they were explained as due to the *vis plastica*, or creative force that formed living things out of inorganic materials; as sports of nature; as due to some peculiar fermentative process in the earth, or as originating in some unknown influence of the stars. Another hypothesis, maintained for centuries, and even now persisting in uneducated

communities, explains fossils as the remains of animals and plants washed up on the land, and there stranded by the waters of the Noachian deluge. These erroneous ideas persisted in the face of true explanations by some observers, until the beginning of 1800, when slowly the true nature of fossils and their relations to the rocks in which they are entombed began to be more universally understood, and at last during 1800 to 1840 there were laid the foundations of the science of paleontology.

For further information on the early ideas regarding fossils, consult: Lyell, *Principles of Geology*, vol. i. (New York, 1872); Von Zittel, *History of Geology and Palæontology*, translated by Ogilvie-Gordon (London and New York, 1901). For modes of fossilization and the relations between fossils and the rocks containing them, consult: Geikie, *Text-Book of Geology* (London and New York, 1893); White, "The Relations of Biology to Geological Investigation," in *Smithsonian Institution Report of the United States National Museum for 1892* (Washington, 1894); Marr, *Principles of Stratigraphical Geology* (Cambridge, 1898); Schuchert, "Directions for Collecting and Preparing Fossils," in *Smithsonian Institution United States National Museum, Bulletin No. 39* (Washington, 1895). See also PALEONTOLOGY; PALEOBOTANY; GEOLOGY.

FOSSIL BOTANY. See PALEOBOTANY.

FOSSIL FOOTPRINTS. See ICHNOLOGY.

FOSSIL FORESTS. The popular term applied to groups of petrified tree-trunks. Such forests may be found at the locality and in the position in which they grew, or, what is more frequently the case, they may have been carried some distance from their native soil before being buried and silicified. Fossil trees are not uncommon in the coal measures of the United States; but the most celebrated examples, belonging to more recent geological periods, are those of Arizona and the Yellowstone Park. Along the Little Colorado River, in Arizona, there are great numbers of well-preserved trees, scattered over the surface, some of which attain a diameter of 5 feet, and a length of more than 50 feet. The wood-cells have been replaced by silica, which is either colorless, like quartz, or shows the beautiful tints of agate, opal, and jasper; the structure of the wood is preserved to a most remarkable degree. Heavy beds of Triassic marls cover the surface, and it is in this formation that the trees are found. The silicification was probably accomplished by hot alkaline waters, carrying dissolved silica; there is evidence of volcanic activity in the region which might well give rise to thermal springs. Many of the trees have been removed for cutting and polishing into various artistic objects, rivaling onyx and the rarer marbles in delicacy of color, and this wholesale destruction has given much concern lest the forest be entirely destroyed. A similar fossil forest in the Yellowstone Valley has many erect stumps of large size. Along the shore of Chesapeake Bay, south of Baltimore, is a forest in which the giant trunks of cypress rise from a bed of peat that is covered by Pleistocene clays. The Bad Lands of the Little Missouri abound in petrified trees which have been washed out from shales and sandstones of the Laramie group. Another forest, remarkable for the great size of its trees, is found in

Napa County, Cal. In England fossil trees were laid bare at Parkfield Colliery, near Wolverhampton, in 1844. Within the space of one-fourth of an acre there were 73 stumps with attached roots, the trunks lying prostrate in every direction. The wood was converted into coal. Silesia, Egypt, and the island of Antigua, in the West Indies, also have fossil forests. Consult: Marsh, *American Journal of Science* (New Haven, 1871); Hague and others, "Geology of the Yellowstone National Park," *United States Geological Survey, Monograph 32* (Washington, 1899).

FOSSILIFEROUS ROCKS (from Lat. *fossilis*, dug up, fossil + *ferre*, to bear). Rocks which contain organic remains. If we except the lowest metamorphic rocks of the Algonkian system, in which, as yet, no undoubted fossils have been found, the term is equivalent to 'stratified rocks,' and 'sedimentary rocks,' when used comprehensively; but it may also be applied to a particular bed, barren of organic remains, as in case of an unfossiliferous sandstone compared with a neighboring fossiliferous shale or limestone.

FOSSIL INVERTEBRATES. See PALEONTOLOGY.

FOSSIL PLANTS. See PALEOBOTANY.

FOSSIL VERTEBRATES. See PALEONTOLOGY.

FOSSOMBRONE, fôs'sôm-brô'nâ. A city in central Italy, 44 miles northwest of Ancona by way of Fano, on the ancient Via Flaminia. A noteworthy feature is its cathedral containing a fifteenth-century altar by Domenico Rosselli. The city has a gymnasium, technical schools, and important silk industries. In the vicinity are ruins of the Roman colony Forum Sempronii, which was destroyed by the Goths and Lombards; the hill of Pietralata, sometimes called Monte d'Asdrubale, where, according to tradition, the battle of the Metaurus took place in B.C. 207; and Furlo Pass, a tunnel, 96 feet long, 17 feet wide, and 14 feet high, hewn through the solid rock, as the inscription shows, by Emperor Vespasian in A.D. 76. Population, in 1881, of commune, 9100; in 1901, 10,428.

FOSSOMBRONI, fôs'sôm-brô'nê, VITTORIO (1754-1844). An Italian statesman and scientist, born at Arezzo. He studied at the University of Pisa, and after holding various other offices in the Grand Duchy of Tuscany, became Minister of Foreign Affairs (1796). When Tuscany was converted into the Kingdom of Etruria (1801), he refused office in the Council of State, but acted as Commissioner of Finance and proposed a scheme of monetary reform. In 1805 he became lieutenant-general of the Tuscan troops, and held high office under the French régime. He was a Senator of the Empire and president of a commission appointed by Napoleon to devise means of sanitation in Rome and the Pontine Marshes. When the grand duchy was reestablished, in 1814, Fossombroni was made Prime Minister and president of the Legislature. Here his main work was putting the Tuscan finances on a sound footing. His published works are: *Sur les équations irréductibles au troisième degré* (1778); *Sur l'intensité de la lumière* (1782); the very important *Memorie idrolico-storiche sopra le val di Chiana* (1789); *Sur l'équation conditionnelle* (1794); *Sur le principe de la vé-*

locité virtuelle (1796); and *Sur l'amélioration des marais Pontins* (1805).

FOSS-WAY, or **FOSSE**, THE. A road in England, built by the Romans. It ran probably from the seacoast at Seaton in Devonshire to Lincoln, with a continuation northward to the Humber, known as 'High Street.' The earliest mention of the Foss is in some Anglo-Saxon charters dating from the eighth century, and travelers along it enjoyed from early times the special protection known as the King's Peace. This sanctity it enjoyed together with the other three so-called Roman ways: Watling Street, Icknield Street, and Ermine Street. There can be no doubt that the Foss was constructed early during the Roman occupation in order to facilitate that easy communication so necessary for the military control of the island. It was still in good condition in the twelfth century, but has now almost disappeared. Consult Guest, "The Four Roman Ways," in *Origines Celticae* (London, 1883).

FOSTER, ABBY KELLEY (1811-87). An American reformer, born of Quaker parentage, at Pelham, Mass. After attending the Friends' School at Providence, R. I., she taught for several years in various Massachusetts towns. In 1837 she gave up teaching, and delivered a series of lectures in favor of the abolition of slavery. She was the first woman who had ever appeared before mixed audiences as an advocate of anti-slavery principles, and although she was the object of considerable harsh criticism, and was compelled to suffer indignities and rough treatment, her attempt met with considerable success. In 1845 she married Stephen Symonds Foster (q.v.), the abolitionist, and for several years they continued their speaking tours together. Afterwards she became an advocate of prohibition and woman's suffrage.

FOSTER, ANTHONY. The miserly custodian of Amy Robsart, at Cumnor Hall, in Scott's novel *Kenilworth*. He assists in her murder, but meets his reward by accidentally shutting himself in a secret chamber, in which he starves to death. Ashmole's *Antiquities of Berkshire* do not agree with Scott's account of Foster's death, but state that after the murder he pined away and died of remorse.

FOSTER, SIR AUGUSTUS JOHN (1780-1848). An English diplomat. Through his mother's influence (she had married the Duke of Devonshire after the death of John Thomas Foster) he was made secretary of the English legation at Naples, and in 1811 was sent to the United States as Minister. At the outbreak of the war he returned to England and was elected member of Parliament. Two years later he was made Minister at Copenhagen; passed ten uneventful years there, and in 1824 went to Turin, where he stayed until 1840 and then retired. He committed suicide on August 1, 1848, probably being deranged at the time.

FOSTER, BENJAMIN. An American landscape painter, born at North Anson, Maine. He was a pupil of Abbott Thayer in New York City, and of Olivier Merson and Aimé Morot in Paris. He is particularly successful with the misty effects of early morning and evening, and moonlight nights, and his pictures usually represent such subjects. His "Mists of the Morning" (1901) obtained the Webb prize. He received a

medal at the Columbian Exposition of 1893, a bronze one at the Paris Exposition of 1901, a silver medal at Carnegie Institute, Pittsburgh, 1900, and another at the Pan-American Exposition of 1901. His night scene at the Paris Exposition was purchased by the French Government for the Luxembourg Gallery.

FOSTER, BIRKET (1825-99). An English painter and engraver, born at North Shields, February 4, 1825. Early apprenticed to E. Landell, a wood-engraver, he devoted some years to illustrating, and also engraved plates for Gray's *Elegy*, *The Ancient Mariner*, *Old English Ballads*, and Longfellow's *Evangeline*. He drew for the *Illustrated London News*, and was for a time represented in the early numbers of *Punch*. About 1859 he began drawing in water-colors, and in 1862 was made a member of the Society of Painters in Water-Colors. His choice of subjects was drawn mostly from rural life, and he especially emphasized the landscape element. He became very popular, and his works were much reproduced in photographs and chromos. Among those well known are "Nutting," "The Bird's Nest," "Sailing the Boat," "Cows in the Pool," "Feeding the Ducks," "Arundel Mill," "Castle of Rheinfels," etc. At a later period he also painted in oils, but not with equal success. Consult: Hulsh, *Birket Foster: His Life and Work* (London, 1890); Scherer, *The Birket Foster Album* (Münich, 1890).

FOSTER, CHARLES (1828-1904). An American politician and Secretary of the Treasury. He was born near Tiffin, Ohio. He was educated at Norwalk Academy, and entered his father's store, becoming a partner, and finally succeeding to the control of the business, which under his efficient management became one of the largest retail and wholesale mercantile establishments in the State. In connection with this business he established a bank, and dealt largely in grain and produce. During the Civil War he actively aided in the recruiting and equipment of the Ohio troops. It was not until 1870 that he entered political life. In that year he was nominated by the Republicans of his district for Congress, and was elected. He was reelected in 1872, 1874, and 1876. In the winter of 1874-75 he visited New Orleans as chairman of a sub-committee of Congress appointed to examine into frauds in Louisiana. In 1879 he was nominated for Governor of Ohio, and was elected by 17,000 majority, and two years later, in 1881, was reelected, serving until January 1, 1884. His administration was marked by reforms in the management of State institutions, and by an attempt to reform the taxation of the liquor traffic. In 1889 Foster was appointed by President Harrison chairman of a commission to draw up a treaty with the Sioux Indians. In February, 1891, he succeeded William Windom as Secretary of the Treasury in Harrison's Cabinet.

FOSTER, FRANK HUGH (1851—). An American clergyman of the Congregational Church. He was born in Springfield, Mass., graduated at Harvard in 1873, from 1873 to 1874 was assistant professor of mathematics in the United States Naval Academy, and in 1877 graduated at Andover Theological Seminary and was ordained to the Congregational ministry. In 1877-79

he was pastor at North Reading, Mass.; in 1879-82 studied at Göttingen and Leipzig; and from 1882 to 1884 was professor of philosophy in Middlebury College. In 1884 he was appointed professor of Church history in the Oberlin Theological Seminary; and in 1892 was chosen professor of systematic theology in the Pacific Seminary, Berkeley, California. He was at various times an editor of the *Bibliotheca Sacra*; associate editor of Jackson's *Concise Dictionary of Religious Knowledge and Gazetteer* (1891); and contributed to Jackson's *Huldreich Zwingli* (1901).

FOSTER, GEORGE BURMAN (1858—). An American theologian, born at Alderson (Monroe County), W. Va. He graduated in 1883 at West Virginia University (Morgantown, W. Va.), at the Rochester (N. Y.) Theological Seminary in 1887, and was pastor of the First Baptist Church of Saratoga Springs (Saratoga County), N. Y., from 1887 to 1891. In 1891-92 he studied at the universities of Göttingen and Berlin, from 1892 to 1895 was professor of philosophy in McMaster University, and in 1895 was appointed to the chair of systematic theology in the University of Chicago.

FOSTER, GEORGE EULAS (1847—). A Canadian political leader. He was born in Carleton, New Brunswick, and graduated at the University of New Brunswick in 1868. For three years he taught school at Fredericton, and in 1871 was appointed to the chair of history and classics in his *alma mater*, spending two years in study at Edinburgh and Heidelberg before entering upon his duties. He resigned his professorship in 1879, and after two years spent in lecturing on temperance problems in Canada and the United States, he entered politics, and was returned in 1882 to the Dominion House of Commons as a Liberal-Conservative from Kings County, New Brunswick. His scholarship and his fluency as a speaker won him early recognition, and in December, 1885, he entered Sir John A. Macdonald's Cabinet, as Minister of Marine and Fisheries. In this office he was called upon to prepare the case for Canada to be presented to the joint commission in Washington which had been appointed to settle the long-standing dispute over the deep-sea fisheries. His brief for Canada was an able presentation, and left its impress on the Bayard-Chamberlain Treaty of 1888. In May, 1888, he succeeded Sir Charles Tupper as Minister of Finance, and continued to hold this portfolio in all the succeeding Cabinets until the fall of the Conservative Party from power in January, 1896. He is an ardent champion of British Imperial federation.

FOSTER, HENRY (1796-1831). An English navigator. He entered the navy in 1812; accompanied the commission on the northwest boundary between the United States and British North America, and made surveys of the mouth of the Columbia. In 1819-20 he sailed to South America, and began his important observations with the pendulum. He was a member of the expedition to Greenland and Norway in 1823; and in the following year, and again in 1827, sailed with Parry on his northwestern and polar voyages. The results of his observations on the variation of the needle were printed in the *Philosophical Transactions* (1826), and he received the Copley medal and the grade of commander for this work. In 1828 he started for

the South Seas to make pendulum observations and to study ocean currents and meteorology. He rounded Cape Horn after observations near Montevideo, touched on the South Shetland Islands, and after much cruising landed at Panama, and measured by rockets the meridian distance between Panama and Chagres. He was drowned in the river Chagres a day or so after. His note-book was stolen, but his other papers were published by Webster in a *Narrative of a Voyage to the Southern Atlantic Ocean* (1834).

FOSTER, ISAAC (1740-81). An American physician and surgeon, born in Charlestown, Mass. He graduated at Harvard in 1758, studied medicine in Paris and London, and returned to practice at Charlestown. He was a delegate to the first Provincial Congress of Massachusetts in October, 1774, and on the outbreak of the Revolution he gave up his large practice and joined the Continental Army as a volunteer surgeon. In the fall of 1775 he was appointed by Washington acting director-general of the military hospital service of the American forces. He remained in the service after the appointment of Dr. John Morgan to that position by Congress, was personally attached to Washington's headquarters, and in 1777 was surgeon-in-chief of the Eastern Department of the Continental armies. He resigned in 1780 on account of failing health.

FOSTER, JOHN (1770-1843). An English essayist, son of a weaver, born in the parish of Halifax, Yorkshire, and educated for the ministry at the Baptist college in Bristol. After preaching for several years to small congregations, he resolved to devote himself mainly to literature. In 1805 appeared his popular *Essays, in a Series of Letters*. The volume contained four essays, entitled: "On a Man's Writing Memoirs of Himself," "On Decision of Character," "On the Application of the Epithet Romantic," and "On Some of the Causes by which Evangelical Religion has been rendered less Acceptable to Persons of Cultivated Tastes." In 1808 Foster married a Miss Snooke, to whom his essays were addressed, and retired to Bourton, a village in Gloucestershire, where he lived a studious life, preaching, however, in the neighboring villages on Sundays. In 1820 appeared his celebrated *Essay on the Evils of Popular Ignorance*, in which he urges the necessity of a national system of education. To the *Eclectic Review* he contributed nearly two hundred articles. He died at Stapleton, near Bristol. Consult his *Life and Correspondence*, edited by Ryland (London, 1846; republished in Bohn's Library, 1852).

FOSTER, JOHN GRAY (1823-74). An American soldier, born at Whitefield, N. H. He graduated at West Point in 1846, and served with the rank of brevet second lieutenant in the southern campaign of the Mexican War. From 1855 to 1857 he was principal assistant professor of engineering at West Point, and between 1857 and 1861 served as superintending engineer of the survey of the site of the fort at Willets Point, N. Y., and of the construction of Fort Sumter and the repairing of Fort Moultrie in Charleston Harbor. On December 26, 1860, he received the brevet of major for his part in transferring the Federal garrison from Fort Moultrie to Fort Sumter, and on April 12-13 he assisted in the defense

of the latter fort. He then acted as superintending engineer of the construction of the fort on Sandy Hook, N. J., from May to November, 1861; was raised to the rank of brigadier-general of volunteers in October, 1861; and commanded a brigade during General Burnside's North Carolina expedition of January to July, 1862, receiving the brevet of colonel. He became a major-general of volunteers in July, 1862; and from July, 1862 to July, 1863, was in command of the Department of North Carolina. From July to November, 1863, he commanded the Department of Virginia and North Carolina, and from December, 1863, to February, 1864, the Army and Department of the Ohio, and was brevetted brigadier-general and major-general in the Regular Army. He was in command of the Department of the South from May, 1864, to February, 1865, and of the Department of Florida from August, 1865, to December, 1866; was mustered out of the volunteer service in September, 1866, and subsequently, until his death, was engaged as lieutenant-colonel of engineers on various important engineering works for the Government, notably the improvement of Boston Harbor and the construction of the defenses in Portsmouth Harbor. In addition to a number of magazine articles, he published *Submarine Blasting in Boston Harbor* (1869).

FOSTER, JOHN WATSON (1836-). An American diplomat, born in Pike County, Ind. In 1855 he graduated at the Indiana State University. At the beginning of the Civil War he entered the Union service as a major of volunteers, and after attaining the rank of colonel headed a brigade in General Burnside's expedition to East Tennessee, and was the first to occupy Knoxville (1863). In 1873-80 he was Minister to Mexico, in 1880-81 Minister to Russia, and in 1883-85 Minister to Spain. In 1891 he was engaged as a special agent to assist President Harrison and Secretary Blaine in the negotiation of reciprocity treaties, in which capacity he assisted in settling the dispute with Chile. During the Bering Sea controversy he acted as agent to prepare and conduct the case of the United States before the arbitration tribunal. Upon the death of Mr. Blaine General Foster succeeded to the Secretaryship of State (1892-93). Later he was legal adviser to the Chinese plenipotentiaries in their peace negotiations with Japan (1895); again represented the United States in the Bering Sea question (1897); and in 1898 was a member of the Anglo-American Joint High Commission to settle the disputes between Canada and the United States. Besides numerous magazine articles, he published *A Century of American Diplomacy* (1900).

FOSTER, JOHN WELLS (1815-73). An American geologist and paleontologist. He was born at Brimfield, Mass., and graduated at Wesleyan University, Middletown, Conn., in 1834. He removed to Ohio, studied law, and was admitted to the bar at Zanesville; but having spent his leisure in the study of geology, he accepted a position as assistant in the Geological Survey of Ohio in 1837, and was employed until 1844 in investigating the coal-beds of the State. In 1844 he returned to Massachusetts. In 1847 he was assigned with Josiah Dwight Whitney (q.v.) to assist Prof. Charles T. Jackson in a geological survey of the Lake Superior region. Foster and

Whitney completed the work alone, and the results of their investigations were published by authority of Congress as *A Synopsis of the Explorations of the Geological Corps in the Lake Superior Land District in the Northern Peninsula* (1849), and *Report on the Geology and Topography of a Portion of the Lake Superior Land District in the State of Michigan: Part I., The Copper Lands* (1850); *Part II., The Iron Region* (1851). For the next few years Foster remained in Massachusetts, where he was active in the 'Native American' movement, and was associated with Henry Wilson in the organization of the Republican Party in the State. In 1858 he removed to Chicago, where he lived for the remainder of his life, for some years holding the chair of natural philosophy in the old University of Chicago, and devoting himself to scientific investigation, in particular to the paleontology and ethnology of the Mississippi Valley. He was president of the American Association for the Advancement of Science (1869). Among his later published works are: *The Mississippi Valley* (1869); *Mineral Wealth and Railroad Development* (1872); and *Prehistoric Races of the United States* (1873).

FOSTER, JUDITH ELLEN (HORTON) (1840—). An American lecturer, born at Lowell, Mass. She removed to Iowa, studied law, and was admitted to the State bar in 1872. She also became superintendent of the Legislative Department of the Woman's Christian Temperance Union, and when that organization was affiliated with the Prohibition Party, identified herself with the Non-Partisan Woman's Christian Temperance Union, to whose presidency she was elected. She has been known as a popular lecturer on various topics, and has published a *Constitutional Amendment Manual* (1882).

FOSTER, LAFAYETTE SABINE (1806-80). An American political leader and legislator. He was born in Franklin, Conn., and graduated at Brown University in 1828. He studied law, settled at Norwich, and took an active part in politics as a Whig. He was elected to the Connecticut Legislature in 1839 and 1840, and was chosen to its sessions of 1846, 1847, and 1848, in the latter two sessions acting as speaker of the Assembly. In May, 1854, he was elected to the United States Senate by the combined votes of Whigs and Free-Soil Democrats. In 1856 he joined in the movement for the organization of the Republican Party, and in 1860 was reelected to the Senate as a Republican. During the entire Civil War period he was chairman of the important Committee on Foreign Affairs, and was often consulted by President Lincoln. In 1865 he was chosen president *pro tempore* of the Senate, and on the death of Lincoln and the succession of Johnson he became, according to the Constitution, the acting Vice-President of the United States. He declined to be a candidate for reelection in 1867, became a Liberal Republican in 1872, and two years later he was an unsuccessful candidate for Congress on the Democratic ticket. He was a judge of the Connecticut Superior Court from 1870 to 1876, and in 1878-79 was a commissioner to settle the New York-Connecticut boundary dispute.

FOSTER, Sir MICHAEL (1836—). An English physiologist, born at Huntingdon. He was educated at University College, London, and in

1869 became professor of practical physiology there. A year afterwards he accepted a similar position at Trinity College, Cambridge, and in 1883 was appointed professor of physiology at the University of Cambridge. In 1899 he was president and afterwards was elected secretary of the British Association; and in 1900 he was elected to Parliament as representative of London University. His publications include: *Report on Modern Microscopes* (1867); *Primer of Physiology* (1874); *Studies from the Physiological Laboratory in the University of Cambridge* (1876-77); *A Text-Book on Physiology* (1877); *The Elements of Embryology* (1874), with F. M. Balfour; and *Course of Elementary Practical Physiology* (1876), with J. N. Langley.

FOSTER, RANDOLPH SINKS (1820-1903). An American clergyman of the Methodist Episcopal Church, born at Williamsburg (Claremont County), Ohio. He studied at Augusta College (Milledburg, Ky.), and entered the itinerant ministry of the Methodist Episcopal Church in the Kentucky conference in 1837. Subsequently he was transferred to the Ohio and New York conferences, from 1857 to 1860 was president of the Northwestern University (Evanston and Chicago, Ill.), and from 1860 to 1862 held pastorates successively in New York City and Ossining, N. Y. In 1868 he became professor of systematic theology in Drew Theological Seminary (Madison, N. J.), and in 1872 president of that institution. He was elected a bishop in 1872, and made visits to the missions of his Church in South America (1874), Germany and Scandinavia (1874 and 1883), India (1882), Italy (1883), and Mexico (1886). His publications include: *Objections to Calvinism as It Is* (1848); *Christian Purity* (1869); *Centenary Thoughts* (1884); *Beyond the Grave* (1879); *Union of Episcopal Methodisms* (1892); *Philosophy of Christian Experience* (1890); *Studies in Theology* (6 vols., 1889-99).

FOSTER, Sir ROBERT (1589-1663). An English jurist, the youngest son of Sir Thomas Foster, a judge under James I. He was called to the bar in 1610; was knighted and made a justice of common pleas in 1640. An eager upholder of Charles, he condemned Captain Turpin (1644), but was merely removed from office by Parliament, while his colleague was impeached for high treason. During the Commonwealth he practiced as a conveyancer, and on the Restoration he was appointed Chief Justice of the King's Bench (1660), and dealt as sternly with sectaries and political prisoners as if he had not himself enjoyed great toleration under Cromwell. He urged the King to approve the execution of Sir Harry Vane, and was justice at the trial of Sir Charles Sedley in 1663.

FOSTER, STEPHEN COLLINS (1826-64). An American song composer, born at Lawrenceville, near Pittsburg, Pa. Foster's musical gifts seem to have been natural, as he taught himself the flageolet when he was but seven. Many of his songs, the first of which, "Open Thy Lattice, Love," was published in 1842, have become so popular that they may be regarded as veritable folk-songs; for which reason it is fortunate that, although simple in technical treatment, they are, as a rule, refined and graceful in their melody. "Louisiana Belle," "Old Uncle Ned," "My Old Kentucky Home," "Massa's in the Cold, Cold

Ground," "Ellen Boyne," the famous "Old Folks at Home" ("Down on the Suwanee River"), "Come Where My Love Lies Dreaming," are some of the most popular of Foster's 175 published songs. His last song was "Beautiful Dreamer." Foster was improvident, and notwithstanding the enormous sales of his songs (e.g. "Old Folks at Home," 300,000 copies), was frequently harassed for want of money, and obliged to sell his manuscripts outright for pitifully small prices. He died in New York.

FOSTER, STEPHEN SYMONDS (1809-81). An American abolitionist, born at Canterbury, N. H. He followed the carpenter trade for several years, then entered Dartmouth College with the intention of preparing for the ministry, and graduated in 1838. While studying at the Union Theological Seminary he became imbued with abolitionist ideas, and determined to give up the ministry and become an anti-slavery advocate. This decision he followed, and soon became widely known as an earnest and fearless orator. The refusal of the churches to coöperate in the abolition movement aroused his indignation, and he bitterly denounced both churches and clergy as hypocritical and non-Christian. His radicalism caused him frequently to be attacked by mobs, and his method of appealing to the people by entering churches during service and addressing the audiences unannounced gave rise to numerous grave disturbances and precipitated several riots. In 1845 he married Abby Kelley (see **FOSTER, ABBY KELLEY**). Besides numerous articles on the slavery question in magazines, he published *The Brotherhood of Thieves: A True Picture of the American Church and Clergy* (1843, reprinted 1886).

FOSTER, THEODOSIA TOLL (1838—). An American author, born at Verona, N. Y., and educated at Oneida Seminary. She married James H. Foster in 1869, and for many years was principal of the Home School at Verona. She has written her many stories under the pen name of "Faye Huntington," including *Mr. McKenzie's Answer* (1876); *Ripley Parsonage* (1877); *From Different Standpoints*, with Mrs. Alden (1878); *Echoing and Re-Echoing* (1879); *Mrs. Deane's Way* (1880); *Millerton People* (1884); *What Fide Remembers* (1885); *The Boynton Neighborhood* (1895); *A Modern Exodus* (1897); *His First Charge* (1897); and *Lewis Elmore, Crusader* (1898).

FOSTORIA. A city in Seneca and Hancock counties, Ohio, near the boundary line of Wood County. 35 miles south by east of Toledo; on the Baltimore and Ohio, the Lake Erie and Western, and three other railroads (Map: Ohio, C 3). It is the seat of the Ohio Normal University. Fostoria was settled by the father of Charles Foster, Governor of Ohio and Secretary of the United States Treasury in 1891-93, and by the latter was built up and made an important manufacturing place. It has several glass-factories, flour-mills, brass and iron works, a carriage-factory, spoke and bending works, planing-mills, stave and barrel factories, carbon-works, a safe-factory, etc. In the vicinity are oil-fields and a productive farming section. The government, under a charter of 1889, is vested in a mayor, biennially elected, and a city council. The water-works are owned and operated by the municipality. Population, in 1890, 7070; in 1900, 7730.

FOTHERGILL, fōth'ēr-gil, JESSIE (1856-91). An English novelist, born in Manchester, where her father was a wealthy cotton manufacturer. Her first novel, *Healey*, was published in 1875, and her great success, *The First Violin*, in 1877. Her novels, most of which depict life on the moorland and in the factory towns of the north of England, are remarkable for their powerfully drawn studies of character. Her published books, besides those mentioned, include: *Aldyth* (1876); *The Well-fields* (1880); *Kith and Kin* (1881); *Made or Marred* (1881); *One of Three* (1881); *Peril* (1884); *Borderland* (1886); *The Lass of Leverhouse* (1888); *A March in the Ranks* (1890); and *Oriole's Daughter* (1893). A dramatization of *The First Violin* by Sidney Bowkett has been successfully produced.

FOTHERGILLIA, fōth'ēr-gil'ī-ā. A variety of *Nerine curvifolia* grown in conservatories to a slight extent for its numerous brilliant red flowers, which are borne in umbels on long scapes. The flowers are especially attractive on account of their glistening in the light, as if sprinkled with hoar frost. Owing to the habit of making growth during the winter and blossoming during the autumn, this plant, like others of its genus, will not become popular as a florist's flower, but will be grown only in private greenhouses. See Colored Plate of **AMARYLLIDACEÆ**.

FOTHERGILL PROCESS. A process in photography which has for its object the preservation of sensitive plates ready for exposure. It consists in the partial removal of the free silver nitrate which adheres to the collodion film when it is withdrawn from the sensitizing bath by washing with water, and the subsequent conversion of the remaining free silver nitrate into silver aluminate and chloride by pouring over the plate dilute albumen containing ammonium chloride, the excess of the albumen being finally washed off with water. The plates are set aside to drain on folds of blotting-paper, and when dry are ready for use.

FOTHERINGAY, fōth'ēr-īn-gā, THE. The stage name of Emily Costigan (q.v.), in Thackeray's *Pendennis*.

FOTHERINGAY CASTLE. A famous castle which once stood near Peterborough, Northampton, England. It was built in 1405, and was the birthplace of Richard III. in 1452, and the place of execution of Mary, Queen of Scots. It was demolished by James I. Its site is at present occupied by a church noteworthy for its admirable architecture, belonging to the Perpendicular period.

FOUCAULT, fō'kō', JEAN BERNARD LÉON (1819-68). A French physicist. He was born in Paris and was educated for the medical profession. His early physical researches were carried on in connection with Fizeau, and the first direct measurements of the velocity of light were due to independent researches by these physicists. In 1850, in the course of his experiments, Foucault proved that the velocity of light in air was greater than in water. His apparatus consisted of a plane mirror capable of rapidly revolving about a vertical axis, and a concave mirror to which the light was reflected from the first mirror. An achromatic lens, a transparent mirror to reflect the light on to an eye-piece, and a source of light comprise the other essential features of the ap-

paratus, which differed from that of Fizeau's in that it could be entirely contained in a laboratory, and did not involve the reflection of the beam of light from a mirror far distant. In 1851 he demonstrated the rotation of the earth on its axis by the diurnal rotation plane of oscillation of a long pendulum with a heavy weight. The following year he invented the gyroscope (q.v.). In 1854 he was appointed physicist at the Paris Observatory. In 1857 he invented the polarizing prism known by his name, and in 1858 succeeded in giving to the mirrors of reflecting telescopes the form of a spheroid or a paraboloid of revolution. He adjusted the great reflector in the telescope of the Paris Observatory in 1859. In 1865 he published a series of papers on a modification of Watt's governor, showing how its period of revolution could be made constant, and on an apparatus for regulating the electric light. He also showed how the sun can be observed without injury to the eye from the excess of light. He was scientific editor of the *Journal des Débats* from 1845. In conjunction with Regnault he published an important paper on binocular vision. He received the decoration of the Legion of Honor in 1850, and was made an officer in 1864. For his biography consult: *Léon Foucault, sa vie et son œuvre scientifique* (Brussels, 1879); and Lissajous, *Notice historique sur la vie et les travaux scientifiques de Léon Foucault* (Paris, 1875).

FOUCAULT CURRENTS, or **EDDY CURRENTS**. Induced currents of electricity generated in a plate or other mass of metal by its motion with regard to a magnetic field or by variations of that field. These currents circulate entirely within the metal, and their energy is expended in generating heat. They are known as Foucault currents, after this famous physicist, who demonstrated that when a copper disk was rotated between the poles of a strong electro-magnet its temperature was greatly increased, though the currents thus produced had been previously observed by other investigators. They play an important part in electrical work, and their effect was first noticed in the construction of compasses where it was found that the magnetic needle would come to rest much quicker when it was placed above a plate of metal. That the currents were due to induction (q.v.) was shown by Faraday, and Foucault and others constructed interesting apparatus to exhibit their action. In the galvanometer a useful application is found when it is desired to damp the vibrations of the magnetic needle, so that it will return to a point of rest quickly through the action of the magnetic field generated by the induced currents in surrounding plates or masses of metal. The most important effects of Foucault currents occur perhaps in dynamo-electric machinery (q.v.), and in the armatures of dynamos and motors and the cores of transformers a laminated form of construction is employed and the different parts separated from each other, so that there will be no currents circulating as the armature revolves or the alternations of current occur. The greatest care in the design and construction is necessary in such cases in order to prevent the generation of a large amount of heat. See **DYNAMO-ELECTRIC MACHINERY**; **ELECTRICITY**; **INDUCTION**; **MAGNETISM**; **TRANSFORMER**.

FOUCAUX, fōō'kō', MARIE FILON (1842—). A French author, the wife of Philippe Edouard Foucaux. Under the pseudonym of Mary Summer she wrote several works on Sanskrit literature, including: *Histoire du Bouddha Sākya-Mouni* (1874); *Contes et légendes de l'Inde ancienne* (1878), a work which was crowned by the Academy; and *Les héroïnes de Kālidāsa et les héroïnes de Shakespeare* (1879). She also wrote several studies and romances of the Empire and the Restoration, among which are: *Le dernier amour de Mirabeau* (1877); *Les belles amies de M. de Talleyrand* (1880); and *Une intrigante de la Restauration* (1888).

FOUCAUX, PHILIPPE EDOUARD (1811-94). A French Orientalist, born at Angers. He was a pupil in Sanskrit of Eugene Burnouf at Paris, and directed a course in Thibetan at the Bibliothèque Royale. In 1852 he was appointed to occupy temporarily the chair of Sanskrit literature in the Collège de France, and in 1862 succeeded Burnouf as titular professor. His publications include: *Grammaire de la langue thibétaine* (1859); *Onze épisodes du Mahābhārata* (1861); and *Le religieux chassé de la communauté* (1873).

FOUCHÉ, fōō'shā', JOSEPH, Duke of Otranto (1759-1820). A French politician and Minister of Police. He was born at Pellerin, in the Department of Loire-Inférieure, May 21, 1759. His father was a merchant captain, and the son was educated with a view to following the same calling; but early in life young Fouché decided for the Church, and after attending the Oratory at Paris, became a teacher at Juilly, Arras, and Vendôme, successively. In 1789 he had risen to be principal of the Collège of Nantes. As soon as the Revolution seemed likely to succeed, Fouché threw aside his ecclesiastical habit and had himself elected a deputy to the National Convention (1792) from Loire-Inférieure. No one was more ardent in bringing about the death of Louis XVI. than Fouché, who took a leading part in the inauguration of the Worship of Reason, and in the spoliation of the churches which took place in 1793-94—a measure which replenished the coffers of the Republic. In October, 1793, he was sent with Collot d'Herbois as commissioner to Lyons, and showed himself a monster of cruelty, boasting publicly of the number of victims he had caused to be put to death. Excluded from the Jacobin Club by Robespierre, after he had held the presidency, Fouché was in danger of losing his life, and was even arrested, but was released by the amnesty of October 26, 1795. He ingratiated himself with Barras by betraying Babœuf and his friends to the Directory, and was sent as Minister Plenipotentiary to Milan. There he plotted against the Cisalpine Republic and was expelled, but immediately was sent as Ambassador to Holland. A few months later he was recalled and made Minister of Police, July, 1799. In this capacity he showed great vigor; he suppressed the newly organized Jacobin Club, and a large number of newspapers, and created an extensive system of espionage. He was won over to the Bonapartist cause, however, participated in the coup d'état of the 18th Brumaire, and became Minister of Police under the Consulate. In the new Government, strangely enough, he became the champion

of moderation; by his advice the list of émigrés was closed, a general amnesty was proclaimed, and a policy of conciliation steadily pursued. He was forced to resign his office in 1802, though raised to the Senate with a large pension, but he still kept up a police system of his own, and in 1804 was reappointed to his former place on account of the many plots against the life and power of Napoleon. It was at this time that he made his famous remark on the execution of the Duc d'Enghien: "It is worse than a crime; it is a blunder."

Under the Empire Fouché was Minister of the Interior as well as head of the police, and controlled the internal government of France during the frequent and prolonged absences of the Emperor. In 1809, on the occasion of the landing of English forces at Walcheren, he issued a proclamation calling on France to show that she could repel the invader without the presence of the Emperor. The proclamation had the desired effect, but it so incensed Napoleon that Fouché was deprived of the portfolio of the Interior, and shortly afterwards another mistake in diplomacy cost him his office as Minister of Police (1810). Disobeying the commands of the Emperor to take charge of the Government of Rome, and to deliver up secret papers which were in his possession, Fouché fell into further disgrace, and fled from France. Later he was allowed to return and reside on his estate at Pont Carré. In 1813 he was sent as governor to the Illyrian Provinces, but after the battle of Leipzig was recalled, and sent to Naples to watch Murat. Fouché, however, had been in secret negotiations with the Bourbons for some time, and did little to prevent Murat's defection. In 1814, on returning to Paris, he was welcomed by Louis XVIII. and offered the police portfolio, but declined. He foresaw the return of Napoleon from Elba, and during the Hundred Days resumed his police functions, though at heart a traitor to the cause he espoused. After Waterloo he went over to the Bourbons and aided in the pacification of the country as Minister of Police, but the law against the regicides in 1816 exiled him from France. He retired to Prague, became an Austrian subject in 1818, and spent his last years at Trieste, where he died, December 25, 1820. There is no good single work on Fouché. His *Mémoires* (4 vols., Paris, 1822-24; English translation, 1828-29), while based on genuine documents, have been declared a forgery by his family. For various aspects of his career consult: Martel, *Types révolutionnaires: Étude sur Fouché* (Paris, 1879); Desmarest, *Témoignages historiques, ou quinze ans de haute police sous Napoléon* (Paris, 1833); Lord Brougham, *Historical Sketches*, vol. iii. (London, 1858).

FOUCHER, fō'shā', JEAN (1508-67). An explorer and colonizer in South America. He was born at Cambrai, Flanders, became a sailor, and accompanied Sebastian Cabot on the voyage to South America which resulted in the discovery of the Paraguay River. He remained at the mouth of the Plata until 1529, and after a few years in Europe, joined the Spanish expedition of Mendoza to Paraguay, in 1534, as pilot. After the founding of Buenos Ayres, he led an exploring party inland, and after an adventurous journey in which he reached as far as the base of the Cordilleras in Peru, he returned to the eastern coast in 1539. He became one

of the advisers of Cabeza de Vaca, the Governor, whom he induced to adopt a friendly policy toward the natives, and with whom, in 1544, he was imprisoned and sent back to Spain. In the following year he was pardoned, and returned to South America, where, as Governor of Entre Rios, he continued his explorations, and did much to establish friendly relations between the colonists and Indians.

FOUCHER DE CAREIL, fō'shā' de kā'rā'y', LOUIS ALEXANDRE, Count de (1826-91). A French diplomat and author, born in Paris. In 1872, he became Prefect of the Department of Seine-et-Marne, in 1876 a member of the Senate, and in 1883 Ambassador at the Court of Vienna. The last-named post he resigned in 1886. He was a recognized authority on the philosophy of Leibnitz. He wrote a series of expository volumes on the subject, including: *Réfutation inédite de Spinoza par Leibniz* (1854); *Leibniz, la philosophie juive et la Cabale* (1861); and *Leibniz, Descartes et Spinoza* (1863). His chief literary work was connected with his edition of the *Œuvres de Leibniz* (1859 et seq.; 2d ed. 1867 et seq.; to include, as projected, 20 vols., of which 7 appeared).

FOUGÈRES, fō'szhā'. The capital of an arrondissement in the Department of Ille-et-Vilaine, France, picturesquely situated on a hill on the Nançon River, 28 miles northeast of Rennes (Map: France, E 3). It is a handsome, well-built town, with wide streets, and in the old quarter retains mediæval traces in the ancient houses with arcades which overhang the sidewalks. There are also some remains of its ancient walls. The castle of Fougères, a picturesque object, was at one time considered the key to Brittany. The churches of Saint Sulpice and of Saint Leonard have many interesting features; a college and three hospitals are among the principal public buildings. In the neighborhood is a great forest containing prehistoric megalithic remains. Population, in 1901, 20,952. Fougères is celebrated for the engagement which took place in the vicinity between the Vendean Royalists and the Republicans, November 15, 1793.

FOUILLÉE, fō'yā', ALFRED JULES EMILE (1838-). A French philosopher, born in La Pouëze, Maine-et-Loire. He began his career as a teacher in the colleges of Louhans and Auxerre, and the lycée of Carcassonne, and was afterwards professor of philosophy at Douai and Montpellier. For three years (1872-75) he held an important position in the normal school at Bordeaux, but was forced by ill health to retire, and devoted himself to the production of treatises upon the philosophies of Plato and Socrates, a *Histoire de la philosophie* (1875, 6th ed. 1892); *L'idée moderne du droit en Allemagne, en Angleterre et en France* (2d ed. 1883); *La science sociale contemporaine* (2d ed. 1885); *Critique des systèmes de morale contemporaine* (2d ed. 1887); *L'enseignement au point de vue national* (1891); *La psychologie des idées-forces*, and other philosophical works, besides contributing articles to the *Revue des Deux Mondes* and the *Revue Philosophique*. His substance is speculative and his style graceful.

FOUL BROOD. A virulent contagious disease of bees due to the action of a pathogenic organism, *Bacillus alvei*. The disease, which

has been known since the time of Aristotle and occurs wherever bee-keeping is practiced, affects chiefly the young bees, and especially weak and badly nourished colonies. When attacked by foul brood the larvæ become extended, lose their plumpness, turn yellow and later brown. Dead larvæ emit a disagreeable odor. When the larvæ die after the cells have been capped, the caps become brownish and sunken; perforations may later be developed. As a rule, the bees show a disinclination to work, remain fanning at the entrance to the hive, and do not remove the dead larvæ. The adults may also become infected. The disease varies in its virulence, and is at times much more fatal than at others. Perhaps the robbing of diseased hives by healthy bees is the chief method by which the disease is spread; but infection may result from the visiting of flowers which have previously been visited by diseased bees. Wax and other bee-keeping supplies may spread the disease. The bacillus of foul brood grows in the presence or the absence of oxygen. The spores may be destroyed by long exposure to direct sunlight or for a period of $2\frac{3}{4}$ hours to a temperature of 100° C. The disease may be eradicated by destroying infected bees, combs, frames, and hives; removing the bees, allowing them to fast for a few days, and then placing them on new comb; or by chemical treatment, such as feeding certain antiseptics in syrup, or in using them to fumigate infected hives and supplies. Formalin has given best results, but carbolic acid, salicylic acid, camphor, thymol, creolin, eucalyptol, and naphthol have been successfully employed. For literature, consult publications referred to under BEE-KEEPING, and Harrison, "The Foul Brood of Bees," in *Centralblatt für Bakteriologie Parasitenkunde und Infektionskrankheiten*, vol. vi., 1900, Nos. 13 to 16 (Jena, 1900).

FOULD, fôld, ACHILLE (1800-67). A French financier and statesman. He was born in Paris, November 17, 1800, of Jewish parents, and was educated at the Lycée Charlemagne. Fould came naturally by his financial gifts, his father being a wealthy banker of Paris. In 1842 he began his political career as a member of the Council-General of the Department of Hautes-Pyrénées, and was immediately after elected a Deputy for Tarbes, the chief town of that Department. In the Chamber of Deputies he acquired a high reputation for the ability with which he handled questions of finance, and in 1844 was appointed reporter to the commission on stamps on newspapers. At that time he was a staunch supporter of Guizot. After the Revolution of 1848, however, he accepted the new régime, and offered his services to the Provisional Government. In July, 1848, he was elected to the Constituent Assembly for the Department of the Seine, and rendered valuable services to the Government, in particular by advising against the issue of assignats. During the Presidency of Louis Napoleon he was four times Minister of Finance, and his repeated resignations for State reasons did not prevent him from being again appointed on the occasion of the coup d'état, December 2, 1851. He once more resigned his position in January, 1852, in consequence of the decree ordering the confiscation of the property of the Orleans family. The same day, however, he was created a Senator, and shortly afterwards returned to power as

Minister of State. In this capacity he superintended the Paris Exposition of 1855 and the completion of the Palace of the Louvre. He remained one of the confidential ministers of Napoleon III. till December, 1860, when he was succeeded as Minister of State by Count Walewski. In November, 1861, he was re-appointed Minister of Finance and held office until January, 1867. He died October 5th of the same year, at Tarbes. His three sons were all prominent in French politics.

FOUL IN THE FOOT. A contagious disease in the feet of sheep, characterized by ulcers and granulations. It is generally controlled and cured by applications of tarry substances. The name has been applied also to tubercular foot-rot, tubercular disease of the bones, and canker.

FOULIS, fow'lis, ROBERT (1707-76) and ANDREW (1712-75). Two eminent printers of Glasgow, brothers, whose names are usually classed together. Robert, the elder, for some time practiced as a barber—in those days a profitable and respectable profession. Having by his abilities attracted the notice of the celebrated Dr. Francis Hutcheson, then professor of moral philosophy in Glasgow University, he was advised by him to establish a printing-press. Accordingly he spent 1738 and 1739 in England and France with his brother Andrew, who apparently had been designed for the Church, and so had enjoyed a better education. In 1741 he started in business as a printer, his first publications being chiefly of a religious nature, and in 1743 was appointed printer to the university. In this year he published an elegant edition in octavo of *Demetrius Phalereus on Elocution*, supposed to be the first Greek work printed in Glasgow. In 1744 he brought out his celebrated immaculate edition of Horace, small 8vo, each printed sheet of which was hung up in the college at Glasgow, and a reward offered for the discovery of any inaccuracy. But, in spite of all efforts, six errors remained. Soon after he took his brother Andrew into partnership; and for thirty years they continued to bring out, particularly in the Latin and Greek classics, some of the finest specimens of correct and elegant printing which the eighteenth century produced, either in Great Britain or on the Continent. Among them were Cicero's *Works*, in 20 volumes; Caesar's *Commentaries*, folio; Homer, 4 vols.; Æschylus; Herodotus, 9 vols., etc.; also an edition of the Greek Testament; Vergil; Gray's *Poems*; Pope's *Works*; a folio edition of Milton, and other publications in English. In all over five hundred and fifty publications came from their press. With the view of promoting the cultivation of the fine arts in Scotland, Robert Foulis, after a two years' visit to the Continent in preparation, commenced, in 1753, an academy at Glasgow for the instruction of youth in painting and sculpture. The expense attending this institution proved too great, and the printing business declined, but continued to be carried on till the death of Andrew, September 18, 1775. In 1776 Robert exhibited and sold at Christie's, Pall Mall, London, the remainder of his paintings, in the hope of recouping his broken fortunes; but after all expenses were defrayed the balance in his favor amounted to only 15 shillings. He died the same year at Edinburgh, on his return to Scotland.

For a catalogue of the publications of the Foulis brothers, consult: Duncan, *Notices and Documents Illustrative of the Literary History of Glasgow* (1831); also Tedder in *Dictionary of National Biography*, vol. xx. (London, 1889).

FOULK, GEORGE C. (?-1894). An American naval officer and diplomat. He was born in Pennsylvania in the early sixties and entered the United States Naval Academy at Annapolis at fourteen, graduated four years later at the head of his class, and as ensign served in the United States Navy on the Asiatic Station. In addition to the ordinary routine of his profession, he mastered the Japanese language and subsequently the Korean. He was detached in 1883, to serve as interpreter and secretary to the Korean Embassy, the first ever sent to Western countries. Arriving in Seoul in June, 1884, he was made naval attaché to the United States Legation and at Government instance made a journey through the country, publishing in the *United States Foreign Relations* his report. He enjoyed the confidence of the King and the progressive men, and on their behalf brought out military instructors and school-teachers from the United States, and aided in the formation of a stock farm and breeding station. Though foreseeing the political storm which broke December 4, 1884, he made a journey in the southern provinces, and after many dangers and hair-breadth escapes, he reached Seoul, acting as chargé d'affaires *ad interim* for 18 months, the youngest man ever intrusted with the duties of a Minister from the United States to a foreign country. Re-entering the service of the Navy, he later resigned, married a Japanese lady, and became professor of mathematics in the Doshisha University in Kyoto, where he died in 1894.

FOULKE, WILLIAM DUDLEY (1848—). An American lawyer, civil-service reformer, and author, born in New York City. He graduated at Columbia in 1869, at the law-school of the university in 1871, was admitted to the bar in 1870, and practiced at New York City until 1876. Having removed to Richmond, Ind., he was there for fifteen years an attorney of the Pittsburg, Cincinnati, and St. Louis railway, and for one year (1883) an editor of the *Palladium* newspaper. About 1890 he retired from the bar. He was a member of the Indiana State Senate from 1882 to 1886; in 1885 introduced a bill to establish civil-service reform in Indiana, and subsequently organized and became president of the Indiana Civil-Service Reform Association. His investigations into the management of the State Hospital for the Insane revealed grave mal-administration, due principally to the 'spoils' system. In the interest of the National Civil-Service Reform League, as chairman of a special commission, he also conducted in 1889-90 a series of investigations into the condition of the Federal civil-service. His publications include: *Slav or Saxon. A Study of the Growth and Tendencies of Russian Civilization* (*Questions of the Day*, No. 43, 1887); *Civil-Service Reform, Its Later Aspects* (*Economic Tracts*, No. 31, 1890); *The Present State of Our Civil Service* (printed with Warner's *The Silver Question*, in the *Publications of the American Social Science Association*, 1891); *The Theory and the Practice of Civil-Service Reform* (in the *Proceedings of the annual meeting of the National Civil-Service*

Reform League for 1894); *Proportional Representation, An Address Before the Municipal League of Boston* (*Publications of the League*, No. 4, 1896); a biography (1898) of Oliver P. Morton, war governor of Indiana; and *Maya, a Story of Yucatan* (1900).

FOULLON, fōŭ'lon' (often wrongly spelled FOULON), JOSEPH FRANÇOIS (1717-89). A French administrator, and one of the earliest victims of the French Revolution, born at Saurmur. He served as Intendant-General of the French Army during the Seven Years' War, and became in 1771 Intendant-General of Finance. Possessor of great wealth through marriage with the daughter of a rich Dutch family, he came to be in the popular mind the personification of all that was detestable, avaricious and hard-hearted, although he seems to have been really generous and sympathetic, and to have spent thousands of francs a year in giving employment to laborers on his estates at Viry. He was, however, active in furthering the measures for the defense of the Crown at the outbreak of the Revolution, and on July 12, 1789, was appointed Minister of Finance to succeed Necker. His task was not only thankless, but impossible of success. Threatened by the populace, he fled to his estates, but was overtaken and brought back to Paris. He was dragged through the streets with a bunch of hay stuffed in his mouth and a garland of thistles about his neck, and finally, in spite of the pleas of Lafayette, was hung to a lamp-post. Consult Chassin, *Les élections et les cahiers de Paris en 1789* (Paris, 1889).

FOUL PLAY. A romance by Charles Reade and Dion Bouicault, published in London, 1869. It was adapted for the stage and produced as a drama in six acts at the Holborn, in 1868, and in five acts at the Olympic, under the title of *The Scuttled Ship*, in 1877. The scene is laid partly in Australia and partly on an island in the Pacific.

FOUL WEATHER, CAPE. See CAPE FOUL WEATHER.

FOUL-WEATHER JACK. A nickname given to the English Admiral John Byron (1723-1786), on account of his ill luck at sea, whether sailing or fighting. He was wrecked in the *Wager* (1740), and afterwards made a hazardous voyage around the world.

FOUNDATION (from Fr. *fondation*, Lat. *fundatio*, from *fundare*, to found, from *fundus*, bottom). The term foundation is employed to designate either the lower courses of a masonry structure or the prepared surface upon which this structure rests. In this article the prepared surface will be called the foundation bed, and the artificial structure above it will be called foundation structure, although there are many cases in practice in which this distinction cannot be adhered to strictly. The importance of foundation work in architecture and engineering hardly needs proof, for it is evident that upon the permanency and strength of its foundation depends the structural integrity of every building, bridge, or other structure. Probably no branch of engineering construction calls for more technical ability and practical skill than foundation work.

FOUNDATION SOILS. The preparation of the

foundation bed and the load which it will sustain depend upon the nature of the foundation soil and its condition, particularly in respect to contained water. Foundation soils vary from hard bed-rock to almost liquid mud and silt. Solid rock is ordinarily the most perfect material upon which to build a foundation structure; but solid rock which disintegrates upon exposure to air or water may be a very unsatisfactory foundation soil. Generally speaking, however, bed-rock will carry safely almost any load which is likely to be placed upon it in ordinary work. Next to solid rock, sand and gravel form perhaps the best foundation soils, if they are so confined that they cannot spread laterally. Compact sand or clean gravel, in thick beds and confined from lateral movement, will sustain a load of from eight to ten tons per square foot. Clay soils vary from hard compact shales, which will carry almost any load, to soft, damp clay, which will squeeze out in every direction when heavily loaded. The stiffer varieties of clay, when dry, will carry a load of from four to six tons per square foot, but if wet will support scarcely half this load. Such soil as mud, silt, and quicksand have practically no sustaining power, and must be penetrated or removed until firm material is reached, or compacted by drainage or other means.

HARD-SOIL FOUNDATIONS. The construction of foundations on or in hard, stable sand, gravel, or clay soil is a comparatively simple task where they are above water-level. In rock the foundation bed is prepared by removing the loose stones and disintegrated rock, and roughly leveling off the surface. When crevices occur in the rock, they are filled with concrete, or if very wide are arched over, and if the natural surface is very much inclined, it is cut into steps like a staircase, instead of being leveled off at the elevation of the lowest point of the foundation area. The foundation structure is begun with a bed of concrete over the rock surface, and continued like masonry-work elsewhere. In hard soils the excavation is carried well below the frost-line, and its bottom is leveled off to receive the broad footing course of the masonry foundation structure.

COMPRESSIBLE-SOIL FOUNDATIONS. Foundation construction in compressible soils comprises first the artificial constructions necessary to reinforce the bearing power of the material, and second the building of the foundation structure. The supporting strength of the soil is reinforced in a variety of ways, but they can nearly all be classed under either pile foundations or platform foundations.

PILE FOUNDATION. In its essentials a pile foundation consists of a group of piles sunk into the ground and carrying on their tops a platform of timber or concrete. Piles are either of timber or of iron. Iron piles are usually either screw piles or disk piles. A screw pile consists of a shaft, usually of iron, but sometimes of wood, having at its foot an iron casting provided with one or two turns of a screw, the blades of which vary from 1½ feet to 5 feet in diameter. In disk piles the screw blades are replaced by a circular iron disk. Timber piles are round tree-trunks with the bark removed and the knots and roughness dressed off. The method of sinking piles varies with their form. Iron screw piles are driven by screwing them into the foundation

soil; timber piles are driven by means of hammers or the water-jet, and disk piles are driven by the water-jet. (See the article on PILE.) The supporting power of piles is due either to their acting as a column whose lower end rests upon a hard structure, or to the friction of the earth upon the side of the pile, or to a combination of both of these actions. Various mathematical methods are employed for calculating this supporting power, which varies with the character of the soil and the depth of the pile. At best the supporting power of piles can only be approximated, and it is customary to load them only to a fraction of their supporting power in order to avoid chances of failure. The number of piles to be used in any particular foundation will depend upon the weight to be supported and other load conditions, but it is seldom practicable to drive them closer together than 2½ feet to 3 feet apart. After being driven, the tops of the various piles are cut off to a common level, and they are ready for the construction of the platform or capping. If a timber platform is used, it usually consists of one or more courses of timber fastened to the tops of the piles and planked or floored over. If concrete is employed, the earth is leveled off a few inches below the tops of the piles, and the spaces filled with a layer of concrete which is carried up thick enough to cover the tops of the piles several inches. The foundation structure is built on the top of the platform.

PLATFORM FOUNDATIONS. The principle of the platform foundation is that of distributing a concentrated load over a large area by means of a platform or raft-like structure. Platform foundations are built of masonry, of masonry

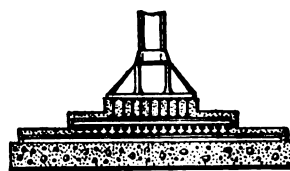


FIG. 1. COLUMN FOUNDATION OF STEEL RAILS AND I-BEAMS IMBEDDED IN CONCRETE.

and metal combined, and of timber. A stone or brick masonry platform foundation consists of a series of inverted arches sprung between the supporting piers or columns. Concrete masonry platform foundations consist of a layer of concrete, of sufficient thickness not to break by bending, deposited over the foundation area. Timber platform foundations consist of two or more layers of timbers spiked together and covering the foundation area. Concrete and steel platforms consist of one or more layers of steel I-beams, railway rails, etc., imbedded in a layer of concrete. Platform foundations are extensively employed for founding buildings on soft ground.

SUBAQUEOUS FOUNDATIONS. Specifically, subaqueous foundations are those constructed on or beneath the bed of a stream or other body of water. Broadly speaking, however, subaqueous foundation processes must generally be employed in all places where the conditions necessitate that the foundation bed shall be below the water-level. The principal subaqueous foundation processes are: (1) the cofferdam process; (2) the crib and open caisson process; (3) dredging through wells; (4) the pneumatic caisson process; and (5) the freezing process.

COFFERDAM PROCESS. A cofferdam (q.v.) is an inclosure from which the water is pumped out, and in which the masonry is laid in the open air. The construction of cofferdams varies considerably. In still, shallow water a bank of earth surrounding the foundation area is often

like the timber platform for a pile foundation. The sides of the box or open caisson are also constructed of timber so arranged that they are water-tight. When the caisson has been grounded and the masonry completed, the sides of the caisson are removed.

The bottom of the caisson which remains in the foundation structure is usually called the crib. Often where crib and open-caisson foundations are sunk onto solid rock beds with an irregular surface, this surface is carefully determined by soundings, and the bottom of the crib is so fashioned that it fits these irregularities.

DREDGING THROUGH WELLS. Foundations constructed by dredging through wells usually consist of timber cribs or metal cylinders sunk by dredging through interior wells or the inside of the cylinder, and thus undermining the foundation, which may be sunk to very great depths.

PNEUMATIC CAISSONS. Described without technicalities, a pneumatic caisson is a water-tight box of timber or metal sunk bottom up or with its open side down. On top of the upturned bottom is built another box open at the top in which the masonry is built. The method of sinking is as follows: The lower box, or the caisson, is towed into position over the foundation site, and masonry is built inside the upper box until the edges of the lower box penetrate into the stream-bed. Air under pressure is then forced into the lower box, expelling the water underneath it, and men can then work underneath as in a diving-bell. (See DIVING.) These men excavate the earth, which is taken out through the top of the caisson, the caisson sinking deeper and deeper as the excavation proceeds until solid rock or other suitable hard material for a foundation bed is encountered. Concrete is then lowered into the caisson and

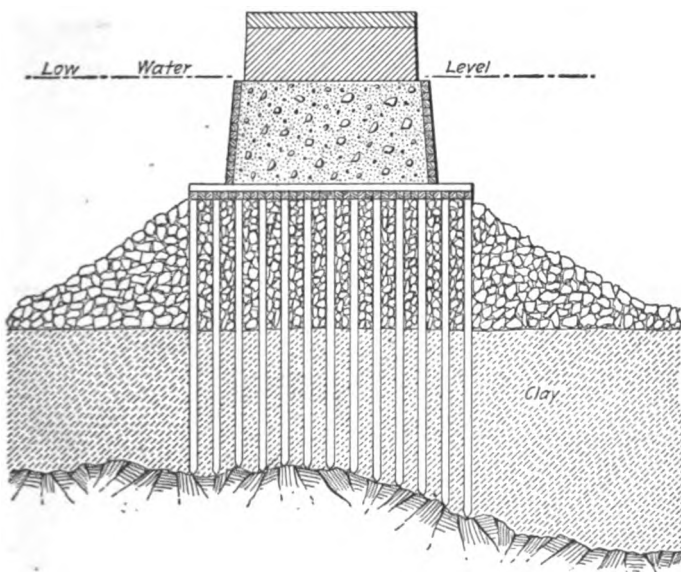


FIG. 2. PILE AND CRIB FOUNDATION FOR A BRIDGE PIER.

employed, or a similar wall of bags of clay, barrels of sand banked on the outside, etc. More generally, however, a double row of sheet piles with the space filled between with rammed clay and earth is built around the foundation area. Cofferdams are limited to works in comparatively shallow water, and where no very great depth of excavation is necessary to reach a good foundation bed. They are particularly adapted to foundations in water-bearing soils on land.

CRIB AND OPEN CAISSON PROCESS. This process consists in building the masonry in a box-like structure open at the top, which sinks as the masonry is added until it rests on the foundation bed. The foundation bed may be prepared

by dredging the bottom until solid material is found, or by driving piles which are cut off at a common level below water. As usually constructed, the bottom of the open caisson consists of one or more courses of timber bolted together,

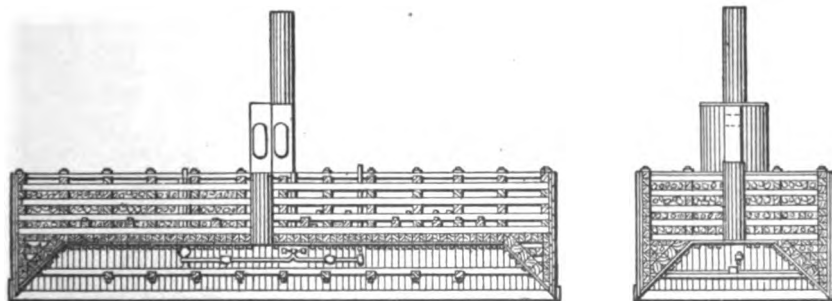


FIG. 3. PNEUMATIC CAISSON FOR FOUNDATION OF A BRIDGE PIER.

the entire space filled with it. The upper box is then removed, leaving the masonry carried on the caisson filled with concrete. This is one of the most valuable methods of subaqueous foundation construction.

by dredging the bottom until solid material is found, or by driving piles which are cut off at a common level below water. As usually constructed, the bottom of the open caisson consists of one or more courses of timber bolted together,

FREEZING PROCESS. This process of foundation construction has been used in comparatively few instances, and always in sinking through water-bearing soil. Its operation is as follows: A row of tubes surrounding the site is sunk into the water-bearing material, and a freezing-liquid is forced into them until the surrounding material is frozen. The frozen material is then excavated and the masonry is built, after which the tubes are removed, and the ground is allowed to thaw out.

NOTABLE EXAMPLES OF FOUNDATION WORK. In the preceding paragraphs the various methods of constructing foundations have been very briefly described. To illustrate the application of these methods in actual work, a few notable examples of foundation construction will be described.

NEW EAST RIVER BRIDGE. The four suspension cables for this structure are carried by steel towers resting on masonry pedestals founded on pneumatic caissons. Each tower has two groups of four legs each, and each group of legs is carried by a separate pedestal and caisson foundation. The caissons for the Brooklyn tower were built of timber, and were 63×79 feet each in plan. They were sunk $97\frac{1}{2}$ feet apart, centre to centre, and with their longer sides parallel. Each structure consisted of a caisson proper and a cofferdam surmounting it, the whole forming a rectangular box 63×79 feet, with a solid flooring placed $7\frac{1}{2}$ feet above the bottom edges. The space between the walls below this floor formed the compressed-air working chamber, and the space above it to the top of the caisson was filled with timber cribwork, with suitable wells left for exit from and entrance to the working chamber. The caisson for the south pier or pedestal was sunk to the greatest depth, about $107\frac{1}{2}$ feet below water-level, which, with one exception, is the greatest depth to which a pneumatic caisson foundation has ever been sunk. After sinking, the entire working chamber and all the open spaces in the caisson proper were filled with concrete. The stone masonry of the pier began on top of the caisson. As indicating the quantities of material and amount of work required in this tower foundation, the following figures are significant:

QUANTITIES	South caisson	North caisson
Timber, cub. ft.....	58,800	74,700
Iron, tons.....	86	98
Concrete, yds.....	5,140	7,245
Stone masonry, cub. yds...	7,755	7,755
Sand excavation, yds.....	3,400	4,000
Clay, yds.....	2,233	4,170
Rock, yds.....	390	940

The following figures give the principal dimensions and other significant general dates of a few other important pneumatic caisson bridge foundations:

NAME OF STRUCTURE	Lateral dimensions, feet	Material	Area, sq. ft.
Third East River Bridge.....	78 X 144	Timber	11,232
Alexander III. Bridge, Paris.....	144 X 110	Steel	15,860
New York and Brooklyn Bridge.....	168 X 102	Timber	17,136
Hayne de Grace, Maryland.....	78.2 X 42.3	"	3,307
Eads Bridge, Saint Louis, Mo.*.	64 X 48	"	3,072
Forth Bridge, Scotland*.....	70	Iron	3,848

*This caisson was sunk to a depth of 109 feet $8\frac{1}{2}$ inches below water. *Four cylindrical caissons of this diameter were employed for each of the two main piers.

HAWKESBURY BRIDGE. The bridge over the Hawkesbury River in Australia was founded by dredging through metal cylinders. The cylinders, or rather ellipses, were 48×20 feet in diameter, and the dredging was done through three tubes which terminated at their bottoms in bell-mouthed extensions which met the cutting edge of the elliptical shell. The space between the dredging-tubes and the outer shell was filled with gravel as the sinking progressed. The material penetrated was mud and sand and the foundation bed of hard gravel was reached at a depth of 185 feet below high water. The shell was filled to low water with concrete and above with cut stone masonry.

POUGHKEEPSIE BRIDGE. The bridge across the Hudson River at Poughkeepsie, N. Y., was founded by first sinking timber cribs, by dredging through interior walls, and then sinking an open caisson on top of the crib. The largest crib sunk was 100 feet long, 60 feet wide at the bottom, 40 feet wide at the top, and 104 feet high. It was divided by one longitudinal and six transverse walls into 14 compartments. The outer walls and the longitudinal interior wall were made wedge-shaped and solid for a height of 20 feet and above that they were hollow. The gravel used to sink the crib was deposited in these hollow walls. The dredging was done through the 14 interior compartments, and when hard bottom was reached at a depth of 134 feet the pockets were filled with concrete.

KINGSBRIDGE POWER-HOUSE. In constructing the power-house for the Third Avenue Railway in New York City, a pile foundation with a concrete platform was constructed having lateral dimensions of $250\frac{1}{2} \times 319\frac{1}{2}$ feet. At the site of the foundation a bed of fine sand overlaid solid rock at a depth of over 100 feet. A cofferdam of sheet piling was constructed entirely around the foundation. The bearing piles were driven 2 feet and 4 inches apart under the boiler-house and 2 feet 6 inches apart under the engine-house. This spacing refers to the piles inside the first row around the entire building. The piles in this first row were driven close together and with a slight slant outward and downward. This arrangement was adopted to aid the sheet piling in confining the sand. The inner bearing piles were all driven vertically by the water-jet. The tops of the piles were cut off at a uniform level of 6 inches above the bottom of the excavation, and were capped with a layer of concrete $7\frac{1}{2}$ feet thick or 7 feet thick above the tops of the piles. This concrete cap was a solid monolithic structure.

AUDITORIUM HOTEL. The Auditorium Hotel in Chicago rests on a platform foundation consisting of a timber platform 2 feet thick covered with a layer of concrete 5 feet thick; in the concrete are imbedded three layers of railway rails, a layer of V-beams, and a layer of I-beams. The area of the foundation is 60,000 square feet.

TALL BUILDINGS. The Fair Building in Chicago is notable as presenting one of the most typical examples of the steel and concrete floating foundation so extensively used in that city and elsewhere. The framework of the building is carried by 46 columns. The foundations of these columns consist in each case of, first 18 inches of concrete on top of which are laid, cob-house fashion, three layers of railway rails, the interstices be-

tween which are filled with concrete. Each succeeding layer of rails has smaller lateral dimensions than the preceding layer, so that the structure is pyramidal in form. On top of the third layer of rails is placed a layer of rolled I-beams, filled between and outside with concrete, and on these I-beams rests a cast-iron pedestal. The total depth of the foundation structure exclusive of the pedestal is about 4 feet. Some of these foundations carry a single column and some carry two columns, and their lateral dimensions vary with the number of columns carried and with the loads on the columns. Nearly all of the tall buildings of Chicago have foundations of this general construction. The Broad Exchange Building in New York City is founded on pneumatic caissons sunk to hardpan. The framework of the building is carried by 100 columns and the foundations were designed upon the general plan that each column should have its individual caisson foundation. All the caissons except those located along some of the party walls are cylindrical and carry the columns concentric with their tops. The party wall caissons are rectangular, with their longer sides parallel to the wall. The cylindrical caissons vary from 7 feet to 9½ feet in diameter, the greater number being of the smaller size. They are filled with concrete to the top and most of them have a granite coping the full size of the caisson. All the caissons were made of steel plate and were sunk by the pneumatic process.

The preceding paragraphs give only a bare outline of foundation construction, the great variety of methods and conditions of such work making a full treatment possible only in special treatises. Among the best books on foundation construction, consult: Patton, *A Practical Treatise on Foundations* (New York, 1893); Baker, *A Treatise on Masonry Construction* (New York, 1900); Fowler, *The Cofferdam Process for Piers* (New York, 1898). Many of the best descriptions of foundation work are found in the engineering journals and the publications of the various engineering societies.

FOUNDER (from ME. *foundren*, to founder, from OF. *fondren*, to sink, from *fond*, Lat. *fundus*, bottom), or LAMINITIS. Inflammation of the vascular sensitive laminae of the horse's foot. It is rarely met with in cattle or sheep, owing to the corresponding structures being in them much less developed. Occasionally the laminae are strained from severe exertion; more frequently they suffer from the morbid effects of cold, which is especially injurious after the excitement and exhaustion of labor. Very commonly also they become inflamed from their close sympathy with diseases of the digestive organs, often following engorgement of the stomach, or inflammation of the bowels. All four feet are sometimes affected, more usually the fore pair only. The feet are hot and tender; the animal stands as much as possible upon the heels; trembles and groans when moved; and is in a state of acute fever and pain. Except when following superpurgation or internal disease bleeding is useful. The shoes must at once be removed, and the toes, if long, reduced, but no further rasping or cutting is permissible. The affected feet should be kept in a tub of water at a temperature of 45° F., or wrapped in cloths wet with cold water. Soap-and-water clysters, repeated if necessary every hour, usually

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suffice to open the bowels, which are very irritable. Physic, if required, must be used with extreme caution. Two drams of aloes is an ample dose in cases of founder. The strain should be taken off the inflamed laminae by getting the animal, if possible, to lie down, or, where this is impracticable, by suspending or supporting him in slings. When the inflammation continues so long that serum and lymph are poured out between the sensitive and horny laminae, free exit for the same must be provided by making an opening through the toe with a small drawing-knife. This may prevent the pumiced and disfigured feet that are apt to follow severe and repeated attacks. After the acute symptoms pass, cold applications to the feet and a mild blister round the coronet help to restore the parts to their natural condition.

FOUNDER OF PEACE. A title given to Saint Benedict.

FOUNDERS AND PATRIOTS OF AMERICA, ORDER OF. An hereditary patriotic society organized in New York City in 1896. The objects of the Order are the association of those whose ancestors struggled together when the United States was a new country; the teaching of a reverent regard for the character of the founders of the country; and the preservation of records relating to the first colonists, their ancestors and descendants. The society admits to membership lineal descendants of an ancestor who settled in any of the colonies prior to May 13, 1657, and whose subsequent ancestors were loyal to the cause of independence. The National Society consists of representatives of the State societies in New York, Pennsylvania, Connecticut, New Jersey, and Massachusetts, and holds its annual meetings on the anniversary of the settlement of Jamestown. The membership is upward of 450.

FOUNDING, or METAL-CASTING. The art of forming in loam or sand a mold of any given design which is subsequently filled with molten metal and allowed to solidify. The resultant casting is a copy in metal of the design or model furnished. The place in which these operations are performed is called a foundry. Foundries are distinguished by either the metals employed or the class of castings made, as iron, steel, brass, statue, type, bell foundries, etc. The variations of working in founding are so numerous that it is possible here to describe even briefly only the general process of iron-founding and a few more important special processes for producing certain kinds of castings.

IRON-FOUNDING may be divided into three operations: (1) The making of the mold; (2) the melting of the metal; and (3) the pouring of the molten metal into the mold. The making of the design or mold, which is usually called the pattern, is not strictly a part of founding, although in most instances foundries have pattern-shops working in conjunction with them as a part of the same plant. Wood patterns are by far the most numerous, although other materials are also used. The molding is usually done in sand or in loam; the great bulk of commercial iron castings being produced in sand molds. Every mold must consist of at least two parts in order that the pattern may be removed. When the desired casting is of complicated form the pattern is usually made in several pieces so joined that

they may be removed one at a time. The process of molding in sand, using flasks, is, briefly stated, as follows: The lower flask, called the drag or swivel, is filled with sand and the lower half of

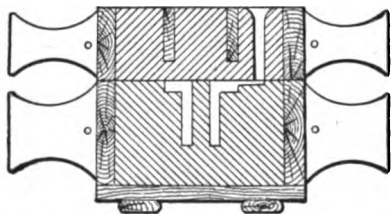


FIG. 1. SECTION OF FOUNDRY FLASK AND MOLD.

the pattern imbedded in it. The upper flask is then placed in position on the lower, and sand is rammed tightly around the upper half of the pattern. The pair of flasks is then turned bottom up and the sand, first loosely placed in the drag, is removed and replaced by firmly packed fresh sand. The pair of flasks is then reversed to their original position, and they are parted along the line of juncture, the pattern remaining in the drag and the mold of its upper part, remaining in the upper flask or cope. After removing the pattern from the drag and finishing up the imperfections in the mold by hand the two flasks are again placed in position and the metal is poured through suitably formed holes or gates. The mode of procedure just described is greatly varied in detail, but its essentials remain the same. For example, the bottom flask is often dispensed with, the lower half of the mold being formed or 'bedded in' the sand floor of the foundry, while the upper half of the mold is formed in a flask or cope, as when a pair of flasks are

ished, are placed in a drying-oven and thoroughly dried. Molds in dry sand admit of exceedingly large and intricate castings being made with much less risk than in green sand.

Loam molding differs from sand molding in that the molds proper are not contained in flasks or bedded in the floor, but are constructed in sections composed of rings, plates, and brickwork. To illustrate loam molding the comparatively simple process of casting a cylinder will be described. A hollow core of iron or brick is first erected and plastered outside with a layer of loam—mixed sand and clay—to the exact inside dimensions of the cylinder. When the loam coating is dried it is washed with a mixture of charcoal and water. A layer of loam is then added, which is laid on and finished off to the exact thickness and exterior form of the cylinder to be cast. This is then dried and washed, as was the core. Around this thickening, as it is sometimes called, is built a shell of brickwork a few inches larger than the thickened core, and the annular space is rammed full of loam. When dried, this shell is lifted by a crane and the thickening removed from the core. The shell or cope is then replaced, and there is an annular space left between it and the core, exactly the dimensions and shape of the thickening. This space is the mold into which the molten metal is poured. This is almost exactly the process of bell-casting. See BELL.

The iron is melted in a cupola, or foundry furnace, which consists essentially of a short iron cylinder mounted on iron columns and lined with fire-brick, and of a belt or wind-box surrounding the cupola near the bottom, and from which several pipes or nozzles, called tuyeres, extend into the cupola to give entrance to the air-blast. Cupolas vary in diameter from two to ten feet. They are cylindrical for a portion of their height, and then conical, to form a chimney. At the top of the cylindrical portion is placed the charging-hole, and at the bottom are one or two breast-holes for raking out the cinders, and a tap-hole through which the molten metal is drawn. The molten metal is run into ladles, which are iron vessels lined with some refractory substance, and provided with a lip for directing the metal into the mold in pouring.

The preceding paragraphs describe very briefly the general process of making iron castings; the following are the special methods adopted in making certain forms of castings which are used in large quantities, such as car-wheels, cast-iron water-pipe, kettles, ordnance, and statuary. The casting of car-wheels varies from the general process described only in having an iron ring for that portion of the mold which forms the tread. This iron ring has the effect of suddenly cooling the metal forming the tread and thus rendering it more dense and hard. This hardening process is called chilling, and is employed in making rolls and other articles which require a hard wearing surface. Water-pipe is cast vertically in cast-iron casings having the core on a barrel. The pattern is inserted in the casing and the annular space between it and the casing is rammed full of sand. The pattern is then removed and the core inserted in its place. In casting kettles, the core corresponding to the inside of the kettle is molded bottom up on a bare plate. A thickening of sand of the exact thickness and exterior form of the

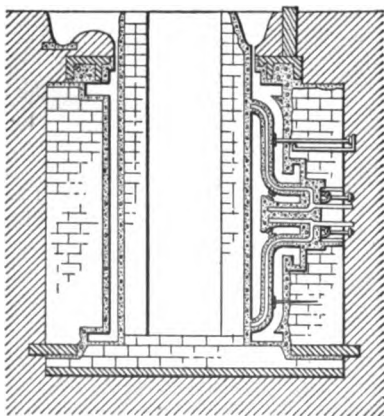


FIG. 2. SECTION OF MOLD ARRANGED FOR CASTING A STEAM ENGINE CYLINDER.

employed. Often also the pattern is parted at the middle, one part remaining in the drag and one in the cope to be separately removed. If the casting is to be hollow, a core of the proper form is suspended in the mold previous to restoring the cope to its position on the drag. These cores are commonly built up on iron coils and are coated with sand. Two varieties of sand-molding are employed: green-sand molding and dry-sand molding. The essential difference is that in dry-sand molding the flasks, after the mold is fin-

kettle is then added to the core. A cope is then built around the thickened core, and when dry is removed to allow the thickening to be broken away, after which it is replaced and the metal poured. All cast-iron hollow ware, pots, pans, etc., are cast in substantially the same manner.

Statue-founding is much similar, except that the thickening of the pattern in bronze-casting is made of wax, which is melted out by heat without lifting the cope. Small statuary casts of lead, tin, zinc, and their alloys are made by pouring the metal into iron molds and, after due time has been allowed for a skin to congeal on the surface, inverting the mold, and allowing the molten inside metal to run out. Iron statues are founded like kettles or bells, with a core thickening of sand or loam and with the cope made in sections to permit removal. Type is cast in metal molds at the ends of which is the matrix for forming the letter. In modern type-foundries the process is a mechanical one performed automatically by type-casting machines.

Cast ordnance is now seldom made, but the process of producing such castings calls for a brief explanation. Bronze and cast-iron cannon are cast in loam molds. The founding of a Rodman gun, which, while now obsolete, is the most recent form of cast gun (see *ORDNANCE*), is as follows: The mold is of dry sand contained in circular sectional casings. The chief feature is the core barrel, which consists of a water-tight cast pipe or barrel with flutes on its exterior surface along its whole length to permit the gas to escape upward from behind the hemp and loam with which the barrel is coated. After the mold has been closed together, the barrel is attached to a spider or tripod, the legs of which rest upon the top flange of the casing; adjusting screws at the end of each leg permit the accurate centring of the core in the mold. A pipe extends down the centre of the core, through which water is forced and escapes by rising through the annular space between the pipe and the inside of the core. The purpose of this process is to cool the gun-casting from the inside outward. In casting a 15-inch gun the water-pipe and core are removed in about twenty-four hours, and afterwards a current of cool air is forced into the bore of the gun, which is cool enough to remove from the mold in about nine or ten days.

These few examples of the many different methods of founding will give a very fair notion of the art. In closing, a word may be said about molding-machines. They are made in a great variety. One of the most important classes comprises machines for molding cast gear-wheels. For a full description of founding processes and tools, consult: Bolland, *The Iron Founder* (New York, 1892); id., *The Iron Founder Supplement*, and id., *Encyclopædia of Founding* (ib., 1893); West, *American Foundry Practice* (ib., 1882); id., *The Molders' Text Book* (ib., 1886); Dingey, *Machinery Pattern-Making* (ib., 1892); Sharp, *Modern Foundry Practice* (ib., 1900).

FOUNDLING, THE. A play by Edward Moore (1748). The plot is based on the false report of the death of the foundling, Harriet Raymond, who in reality, under the name of Fidelia, was sold to a villain, and finally rescued by Charles Belmont, who marries her.

FOUNDLING HOSPITAL or **ASYLUM.** An institution for the care of children, particularly

infants that have been abandoned by their parents or guardians. In modern times the great majority of children in foundling hospitals are not foundlings, but are (1) illegitimate children brought to the institution by the mothers or their friends; (2) legitimate children whose mothers, because of desertion of husband, poverty, or other causes, feel unable to care for them; and (3) a few orphans.

The first foundling hospitals were introduced by the Church to prevent infanticide. In the sixth century the Bishop of Treves permitted children to be placed in a marble basin before the cathedral, with the understanding that members of the church would care for them. The capitularies of the Frankish kings mention foundling hospitals. The first well-authenticated establishment was founded at Milan in A.D. 787, the Council of Nicæa in that year having ordered that each city should have an institution for abandoned children. A foundling hospital was organized at Montpellier in 1070; Einbeck, 1200; Rome, 1212; Florence, 1317; Nuremberg, 1331; Paris, 1362; Vienna, 1380. For the care of children above the age of infancy, see *DEPENDENT CHILDREN*.

The number of foundling hospitals in France was greatly increased through the labors of Saint Vincent de Paul and of Colbert in the seventeenth century. After 1789 the French Republic assumed the charge of foundlings. The children were at first publicly received, but by a decree of 1811 there was introduced into foundling hospitals throughout the Empire a revolving cradle-tour, so arranged that the person who deposited a child in the cradle could not be seen from within. The person was then able to turn the cradle so that the child would be brought within the institution. This was introduced on the ground that thereby child-murder would be lessened. Whether infanticide was materially decreased is not known, but the unexpected and immediate effect was a great increase in the number of children abandoned. The number left at foundling hospitals in 1784 is stated to have been 40,000; in 1815, 68,000; and in 1834, 134,000. Other countries had similar experiences. In 1834 a Parliamentary commission reported that the influence of the *tour* was pernicious; and it was gradually abolished. With the abolition of the *tour* a marked decline in the number of foundlings took place.

At present the public foundling hospital in France serves merely for the temporary care of the infants. Every attempt is made to discover the identity of the mother. If found, persuasion is employed to induce her to take back the child; if she is in need of support, public aid is promised her. When the mother cannot be found, or if she will not take the child back, a place is found for it in a private family, where it is nursed and cared for during the period of infancy. A similar system is in vogue in some of the German cities, notably Leipzig. This system has not only greatly diminished infant mortality, but has very materially diminished the number of children abandoned.

In Vienna foundlings are cared for in a hospital. Mothers who wish to leave children in the institution are required to serve in the hospital as nurses for a period of three months. The system provides for the nursing of children whose mothers are not found. Moreover, after caring

for her child for so long a period of time, the mother is less inclined to leave it if it is possible for her to keep it. The system has been found to yield very satisfactory results.

About 1741 the Foundling Hospital of London began to receive children. It was established by Thomas Coram, a benevolent sailor, who donated 56 acres of land, which now yield in annual rents more than the original purchase price of £5500. At first applications for admission were so numerous that the children admitted had to be chosen by lot. Fifteen years later Parliament gave financial assistance, and all the children deposited in a basket outside the gate were cared for. This system led to such serious abuses that the authorities decided to take charge of only those children who were accompanied by the sum of £100. In 1801 the present form of organization was adopted. A child is admitted only after a careful personal examination of the mother has shown that it is illegitimate and the first born, and that the mother has never lived with the father. Preference is given in cases where the mother has been deceived by a promise of marriage. The hospital is rich and well managed, and takes good care of its foundlings.

In America the county poor farm was the only place at first provided for foundlings. In some places there is still no other public provision. Foundling hospitals, however, are now to be found in all the larger cities. Nearly, if not all, the foundling hospitals are under private management, but many of them receive subsidies from public funds. 'Baby farms' is the name applied to those places where babies are boarded for the sake of the gain. They exist in most of our cities. They are not incorporated, are subject to no supervision or control, though they frequently solicit donations on the plea of charity. They are productive of frightful abuses and should be prohibited.

The death-rate in foundling hospitals frequently ranges from 90 per cent. to 100 per cent., and an average of 75 per cent. is common. The New York Infants' Hospital lost 98 per cent. of its foundlings in 1895, 99 per cent. in 1896, and 100 per cent. in 1897. "Twenty-eight infants were consigned one after another by a public official to a private institution and they all died." The experience of European institutions is identical. The better institutions now recognize this evil and seek to avoid it by having the mother who wishes to leave a child in the institution stay and nurse it and another child also if possible. In the Chicago Foundlings' Home, where this rule is practically enforced, the death-rate is very low. Where this plan is impracticable, the New York Foundling Asylum and others have adopted the plan of placing the infants at board in selected private families. Those receiving the children must comply with the detailed rules of the institution. Medical care is furnished, and a careful system of visitation is maintained. The children are later recalled to the institution, and are finally placed in homes.

Another objection to the present system is that the preliminary investigations are insufficient, so that many children are received who are not properly subjects for charity. Very few foundling hospitals make any further investigation than to question the one bringing the child.

In Massachusetts foundling hospitals have been abolished by law. It is forbidden to board

more than two infants under two years of age in any family unless that family has a license given after thorough investigation, the license stating the number of children allowed. The State Board of Charities has a department for the children, who are boarded out in families. Since the abolition of the foundling hospitals the death-rate has decreased 12 per cent. In 1898 the foundlings from the New York Infants' Hospital were boarded out. The death-rate of those boarded fell to 55.9 per cent. immediately, and later to 31.1 per cent.

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FOUNDRY. See **FOUNDING**.

FOUNTAIN (OF. *funtaine*, *fontaine*, Fr. *fontaine*, from ML. *fontana*, from Lat. *fons*, spring; connected with Gk. *χεῖρ*, *chein*, Skt. *hu*, to pour, AS. *gēotan*, Icel. *gjota*, OHG. *gizzan*, Ger. *giessen*, to pour). A place where there is a continuous flow of fresh water into either a natural or an artificial basin. In southern and eastern countries, where water is of especial importance, not only has great care always been taken to insure its plentiful supply, but this importance has been recognized by beauty of architectural and sculptural decoration. In the ancient world another incentive was added—religious devotion to the water deities, to water nymphs, to gods of curative mineral sources. The earliest preserved example is a large stone basin carved in relief with figures, found in the royal palace at Tello. This Babylonian fountain dates from B.C. 3000. Next is the Assyrian fountain at Bavian, sculptured in the face of the rock itself, where two affronted lions rest their fore paws on the mouth of a vase from which the water spouts into a series of basins cut in the rock and descending to the stream, the lions being at the lowest basin. Ancient Greek fountains of any size were usually inclosed. There was no aquatic display, but the water was gathered into basins under cover, while above these rose *ædiculas* or columns decorated with statues and even colonnaded porticoes under which one descended by stairs to the fountain itself. Smaller Greek fountains were of various kinds. Those standing at street corners had rectangular or circular basins with a spout, and were uncovered. Numerous road fountains belonged to the same class. Others were free-standing, with water spouting from the mouths of lions or boars set in the upper part of a central column through which the water-supply was carried. Many such fountains are represented on Greek vases, but none remain. Recent excavations by the American School of Classical Studies under Professor Richardson have brought to light one of the largest and most famous of Greek fountains, that of Pirene at Corinth, mentioned by Herodotus and restored by the Romans. It was formed of white stone, and contained a number of cells from which the water flowed into an open basin. The city of Corinth possessed many other fountains. In one near the statues of Diana and Bellerophon the water flowed through

the hoofs of the horse Pegasus. The Fountain of Glaucus, inclosed in the Odeum, was dedicated to Glaucus because she was said to have thrown herself therein, believing that its waters would counteract the poisons of Medea. Another Corinthian fountain had a bronze statue of Neptune standing on a dolphin from which the water flowed.

The fountain constructed by Theagenes at Megara was remarkable for its size and decorations, and for the number of its columns. One at Lerna was surrounded with pillars, and the structure contained a number of seats, affording a cool summer retreat. Mystical medicinal, surgical, and other qualities, as well as supernatural origin, were ascribed to fountains, and they were often connected with temples and shrines. Salt springs were sacred to Poseidon; many curative springs to Æsculapius and Hygieia. One at Cyanæ, in Lycia, was said to possess the quality of endowing all persons descending into it with power to see whatever they desired to see; while the legends of fountains and other waters of strange power to heal are numerous in many lands. The famous Enneacrucos fountain at Athens was called Callirrhœ before the time the water was drawn from it by the nine pipes from which it took its later name. Two temples were above it, according to Pausanias, one dedicated to Demeter and Proserpine, and the other to Tripolemus. The fountain in the Temple of Erechtheus at Athens was supplied by a spring of salt water, and a similar spring supplied that in the Temple of Poseidon Hippias at Mantinea. Above the Heraeum of Argos, the centre of Argive worship, was the famous Asterion Fountain. Often the Greeks made rock excavations to capture the water at its source. Among the most notable of these were that near Syllium in Pamphylia, which still remains; that near Larnaka in Cyprus; and the Burinna Fountain near Cos, covered with a dome. Among the famous fountains consecrated to Apollo were the Castalian fountain and the Cassotis at Delphi, connected with the oracle: vapor and gas in the water contributed to the cult.

The water-supply of Rome and the works auxiliary to it were on a scale to be expected from a people of such great practical power. The remains of the aqueducts which stretched from the city across the Campagna are among the most striking monuments of Italy. The aqueducts supplied the baths and the public fountains, from which last all the populace, except such as could afford to pay for a separate pipe to their houses, obtained their water. These fountains were therefore of large size and numerous. They were formed at many of the castella of the aqueducts. According to Vitruvius, each castellum should have three pipes—one for public fountains, one for baths, and a third for private houses. When Agrippa reorganized under Augustus the city's water-supply, he made or restored 700 fountains, decorating 400 with marble columns and 300 with statues of marble or bronze. The Roman fountains, called *salientes*, were generally decorated with figures and heads. A beautiful marble rhyton at Rome (Palazzo dei Conservatori), a Silenus holding a skin, a Triton with shells, river-gods reclining on rocks, are some of the numerous forms of decoration. These and similar ones belong mostly to the *free-standing* as distinguished from the *niche* class. Fountains were often also the ornament of Ro-

man villas and country houses; the water generally fell from above into a large marble basin, with at times a second fall into a still lower receptacle. Not the least interesting of the Pompeian discoveries are the public and private fountains. The public fountains were comparatively simple and of rectangular shape, as were also the public fountains found at the corner of the forum of Thamugadi (Timgad in Algeria), and at Cuiculi (modern Jemila); but the private Pompeian fountains were of rich and varied shapes, usually of mosaic cubes and shellwork and in the form of a niche. Especially interesting are those of the Casa della grande fontana and the Casa della piccola fontana a mosaico, and those of the Casa del Centenario and of the Casa di Lucrezio. In 1880-81 a particularly beautiful one was found, decorated with a statuette of Silenus and with mosaics of the Birth of Venus and the Bath of Venus and the Loves. The public fountains of Pompeii had little ornament except a human or animal head, from the mouth of which it was arranged that the water should issue. Not only did simple running fountains exist, but the remains of *jets d'eau* have been found; and a drawing exists representing a vase with a double jet of water, standing on a pedestal placed in what is supposed to have been the impluvium of a house. There was also a *jet d'eau* at the eastern end of the peristyle of the Fullonica at Pompeii. The Romans were from the earliest times quite as devoted as the Greeks to the cult of sacred springs and their deities, such as Juturna, Picus, and the nymph Egeria, whom legend made the inspirer of King Numa. The discoveries of votive offerings at mineral and other springs show the cults to have been continuous from the Royal to the Imperial period.

As among the Greeks and Romans, so with the early Celts and other northern tribes, traces of superstitious beliefs and usages with relation to fountains can be traced in monumental and legendary remains. At Lochrist, beneath the church, and at the foot of the hill upon which it is built, is a sacred fountain, near which is erected an ancient chapel. Miraculous virtues are yet attributed to its water, and on certain days the country people still come with offerings to draw it. In the enchanted forest of Broche-lande, famous from its connection with Merlin, was the fountain of Baranton, said to possess miraculous characteristics. The Christian missionaries could not easily overcome beliefs so planted in the hearts of the people, and so strengthened by daily practices. By a wise policy, practiced by the Christian Church everywhere during the stage of conversion, finding themselves unable to eradicate the superstitions which ascribed miraculous power to rocks and woods, streams and fountains, connected with the divinities of the old religions, the evangelists changed their form and direction by dedicating these objects to the Virgin and saints, so making the force of the old belief an instrument for its own overthrow. Fountains were attached to the new religion by the erection of statues of the Virgin or of saints upon the possibly rude structures that collected the water and preserved its purity. There is some uniformity in the architectural characteristics of these structures during the Middle Ages. A very common form in rural districts was that in which the fountain was reached by descending steps. A large basin received the

water, sometimes from a spout, but often from the spring itself. This basin was covered by a sort of porch or vault, with, at times, molded arches and sculptured figures and escutcheons. On the bank of the Clain, at Poitiers, is a fountain of this kind, the Fontaine Joubert, which, restored in 1597, was originally a structure of the fourteenth century, with a niche, bench, and stairs descending to the basin. Many such fountains are found in Brittany, and, indeed, throughout France, and the great antiquity of some of them is proved by the superstitions regarding them which still exist among the peasantry. A form more common in populous districts was that of a large open basin, round, square, polygonal, or lobed in form, with a columnar structure at the centre, from the lower part of which it was arranged that spouts should issue, playing into an open basin, and supplying vessels brought for the purpose in the cleanest and quickest manner. The columns take very varied forms, from that of a simple, regular geometrical solid, with only grotesque masks at the spouts, to that of an elaborate and ornate Gothic structure, with figures of virgins, saints, and warriors, with moldings, arches, crockets, and finials. At Rouen the Pucelle Fountain (fifteenth century) has an elaborately sculptured pinnacle. The most exquisite of all Gothic fountains is in Germany, the *Schöne Brunnen* at Nuremberg, a high polygonal structure like a cathedral tower, a mass of tracery and sculpture (fourteenth century). In the public market-place at Brunswick is a fountain of the fifteenth century, of which the central structure is made of bronze. Except in Italy, few fountains are of earlier date than the fourteenth century. The Italian fountains of the Gothic period are, however, numerous and beautiful; some even belong to the late Romanesque age. The most monumental of these are, perhaps, three at Siena: the *Fonte Branda*, celebrated by Dante, built in the twelfth century; the *Fonte Nuova*, 1259; and the *Fonte Gaja*, 1343. This Siennese type was a large rectangular basin, 35 to 50 feet long, with a solid wall on three sides, and an arcade on the front. At the *Fonte Branda* the covering brick structure is 30 feet high, with three groined vaults; battlements, corbels, and blind arches were its main decorations, but terracotta ornamentation is used already in the *Fonte Nuova* and pilasters, with bas-reliefs and statues in niches by Jacopo della Quercia, and other famous sculptors decorated the *Fonte Gaja*, one of the most beautiful in Italy. Of equal beauty is the *Fontana Maggiore* at Perugia, one of the finest works of Niccolò di Arezzo and Giovanni Pisano (c. 1300). It is a twenty-four-sided polygon; four concentric steps lead up to a lower basin 30 feet in diameter, each face decorated with fine reliefs and separated by grouped colonnettes; from the water of this basin rise twenty-four columns supporting the upper polygonal basin, where angles are marked by statuettes. In the centre of this basin is a heavy bronze column supporting a bronze basin where a group of three water-nymphs now stands. To this general type belong the unrivalled group of mediæval fountains at Viterbo, where the central shaft usually rises from the lower basin, with lion-masks spouting the water supporting a second, much smaller basin on its capital, with a smaller and shorter central shaft supporting a third

basin crowned by a pinnacle. In the Gatteschi fountain the two upper basins are quadrilobed, and the lower one is cruciform. They are always raised on a stepped platform, and stand in the centre of squares. Unlike the Siennese type, these fountains are entirely uncovered.

During the Renaissance the designing of fountains became an important and almost a distinct branch of art, combining in one design the resources of architecture, sculpture, and landscape decoration. Fountains were no longer confined to public squares and purposes of utility, but took their place also in the elaborate decorations of the gardens and parks of the villas or palaces of the great and wealthy. This development began in the villas erected during the middle and late Renaissance in Italy, was carried into France, where in the seventeenth century it culminated in the grandiose water effects of Saint-Cloud and Versailles, and spread into Germany and the rest of Europe. England has in general neglected this branch of decorative art, and its chief centres outside of Italy have been in France and in the capitals of the various States of Germany.

In the Italian villas of the sixteenth and seventeenth centuries water became an essential element of the garden designs, always in connection with a monumental treatment of architectural or sculptural accompaniments, to which the leading artists of the time often devoted their talents. Two types chiefly prevailed—the cascade, in which a moderate volume of water was made to produce a maximum of effect by falling in thin but brilliant sheets over multiplied obstructions—steps, basins, rocks, etc.—always in a framework of architecture with abundance of sculptured accessories; and the isolated or central fountain, in which one or many jets spouted upward fell into the highest of a series of superposed *vasques* or bowls of marble or bronze, and thence into a larger one below, and so on into a broad basin on the ground-level. Of the former type, the most extensive example is the series of cataracts in the Caserta palace gardens near Naples, by Vanvitelli (1753); but notable examples of equal or higher artistic merit are those of the Villa Lante, near Viterbo (Viguda, 1540-50), of the Villa d'Este at Tivoli (Fontana, 1580-?), and of the villas Torlonia-Conti, Aldobrandini, and Mondragone, at Frascati.

The superposed-basin type is seen in numerous admirable examples, not only in the villas, but in the public squares of many towns. Among them may be mentioned the beautiful Farnese fountain in the Lante Villa, near Viterbo; the elaborate fountain in the Piazza Pretoria at Palermo (1550), by Florentine artists; the late and highly rococo Fontana Medina at Naples; the Neptune fountain, by Gran Bologna, at Bologna; the Neptune fountain, by Ammanate, at Florence; the fountain in the Piazza Madonna at Loreto; others at Fano, Viterbo (Piazza della Rocca), the Boboli gardens at Florence, etc. At Rome most of the fountains of this type are of late date—e.g. that about the obelisk of the Quirinal, the great basin fountain of the Villa Albani, the Tortoise fountain in the Piazza Mattei, that in the Piazza Navona, etc. At Rome also are three examples of another type, in which a structure like a triumphal arch pours forth one or more cataracts into a large basin, with or

without sculpture; the Acqua Felice in the Piazza dei Termini (sixteenth century); the Fontana Padina (1612); and the Fontana Trevi, the most spectacular of its type and grandly composed, even if in doubtful taste (F. Fuga, 1740). This type, treated as a wall fountain, is the prototype of several fine fountains in Paris, of which the modern Fontaine Saint Michel, by Dariod, is the most ornate.

Among the earliest Renaissance fountains in France is that of Clermont-Ferrand, an elaborate and beautiful architectural design forming a species of lofty canopy in the centre of a large basin (early sixteenth century). Jean Goujon carved the sculptures for the Fontaine des Innocents, designed by Lescot, in Paris (1550; re-erected in recent times on an altered plan), whose nymphs are famous. He also made the Diana for the fountain at the Château d'Anet. The magnificent basins, jets, and other water-works at Versailles belong to a later date. The French have developed the cascade type into a greater variety of forms than is found in Italy, and have handled these with great taste, not only in such 'châteaux-d'eau' as that of Saint Cloud, but in many recent examples in which sculpture plays an important part (Fontaine Sainte Marie, at Rouen; Fontaine Longchamps, at Marseilles). The central shafted type has also been developed by modern French artists in a number of beautiful examples, such as the twin fountains by Hitorff in the Place de la Concorde, at Paris; the Louvois Fountain, by Visconti (1835); and the Fontaine des Saisons, by Carpeaux, in the Observatory gardens, in the same city. The Birague, Grenelle (by Bouchardon), Molière, and Cuvier fountains, in Paris, should also be mentioned. The fountains at Bern, Switzerland, and the Alameda Fountain at Malaga, Spain, are good examples of the simpler type, with statues on central shafts. There are a number of interesting fountains in Belgium; while at Vienna the Neuer Marktbrunnen (1739), the Hochstrahlbrunnen in the Schwarzenberg Palace gardens, and the Albert Fountain, deserve at least passing mention. The highest artificial jet fountain is that of the Palace of Herrenhausen, Hanover, which is over 200 feet high. But no other European country can compare with France and Italy in the number and beauty of its fountains, considered as works of art.

In the Orient the Greek tradition of covered fountains was continued by the Mohammedan artists, though the Moors in Spain often adopted open basins, as in the Fountain of the Lions in the Alhambra. Each city in the East was provided with many fountains, inclosed and usually covered in like the tombs, with one or more domes. Cairo, Constantinople, Adrianople, and Damascus are especially rich in them, there being three hundred in Cairo alone. They are circular, polygonal, or rectangular, and ornamented with brilliant tiles, niches, columns, carving, inlay, and gilding, and have no display of water even within, for it falls into very small basins from a concealed central supply. The finest of the Turkish fountains is the large and highly ornate Fountain of Ahmet III., near the Mosque of Saint Sophia; another almost equally important is in Scutari, a suburb of Constantinople.

Artificial fountains are not abundant in American cities; yet there are some in the parks and squares of New York and other places that are

occasionally in action. A recent innovation is the rising and subsiding water-jet used in New York. Decorative fountains have played an important part in the design of recent exhibitions in the United States, notably the Fountain of the Republic, by Macmonnies, at Chicago in 1893, and the fountains of Man, Nature, Progress, etc., in the Pan-American Exposition grounds at Buffalo in 1901. Within recent years drinking-fountains for men and animals have been put up more liberally in the United States, especially by private individuals, and are often artificially designed and decorated.

FOUNTAIN OF AR'ETHU'SA. See ALPHIEUS.

FOUNTAIN OF CASTA'LIA. See CASTALIA.

FOUNTAIN OF VAUCLUSE, vò'klúz'. See VAUCLUSE.

FOUNTAIN OF YOUTH. A miraculous fountain having the property of restoring youth and healing sickness. Such fountains are a part of the mythology of many lands. In the Middle Ages a fountain of youth was supposed to exist in an island or region called Bimini, and was sought by Ponce de Leon, De Soto, and other Spanish explorers.

FOUNTAINS ABBEY. An extensive Cistercian monastery near Ripon, England, dating from the thirteenth century. Originally the buildings covered an area of 10 acres, but the picturesque ruins represent only a portion of the abbey. The Norman-English church is in good preservation, and the remains of the refectory, chapter-house, and great cloister are still extant.

FOUQUÉ, fò'kà', FERDINAND ANDRÉ (1828—). A French geologist, born at Mortain, and educated at the Normal School at Paris, where he became curator of the scientific museum. After holding positions in several educational institutions and taking part in a large number of scientific expeditions, he became known particularly for his investigations of volcanoes, and in 1877 was elected to the chair of geology in the Collège de France. He was elected to the Academy of Sciences in 1881. He published a large number of scientific works, among the most important of which are: *Introduction à l'étude des roches éruptives françaises* (1879); *Santorin, et ses éruptions* (1879); *Synthèse des minéraux et des roches* (1882).

FOUQUÉ, FRIEDRICH HEINRICH KARL, Baron DE LA MOTTE (1777-1843). A German romantic novelist and poet, best known as the author of *Undine*, a classic of romanticism. He was born in Brandenburg, served in the Prussian Army from 1794 to 1813, and spent the rest of his life chiefly in Paris, on his estate in Nennhausen, and at Halle, where from 1831 to 1842 he lectured on modern history and poetry. He died in Berlin. At first he imitated Spanish poets, and then Norse legend and Old German poetry attracted him. In 1808 he published *Sigurd der Schlangentöter*, founded on the *Nibelungenlied*, and in 1881 a chivalric romance, *Der Zauberring*. Several dramas and tales of minor worth followed. But in 1814 Fouqué reached, in his *Jahreszeiten*, the summit of his genius, for of its four parts the first was *Undine* and the last *Sintram*. The second part contained *Die beiden Hauptleute*, and the third

Aslaugas Ritter and *Algin und Jucunda*. In this year he also published a romance, *Die Fahrt-en Thiodolfs des Isländers*, which he regarded as his best work. His numerous later writings added nothing to his reputation. His selected works (12 vols., 1841) contain little of import save what has been translated into English—*The Enchanted Ring*; *Sintram*; *Aslauga's Knight*; and the exquisite *Undine*.

FOUQUET, fō'kă', or **FOUCQUET**, JEAN (c.1415-c.90). A French miniature painter and illuminator, born in Tours. His first known works were an illuminated Bible and a portrait of Charles VII. These brought him Court favor, and about 1445 he went to Rome, where he painted the portrait of Pope Eugenius IV. After his return to France he executed a series of miniatures for a French paraphrase of Boccaccio (1458; in the Munich Library), and a *Book of Hours*, forty pages of which were bought by the Duc d'Aumale for the Chantilly Collection, for 300,000 francs. Fouquet became Court painter and illuminator to Louis XI., and in this capacity painted a number of portraits. Little of his life or work was known until some modern historians recognized his value, historically and artistically, as one of the founders of the French School. The illustrations for Josephus's *History of the Jews* (in the National Library, Paris) are perhaps his best work. His drawing is vigorous, the expression of his faces lively, and his color clear and glowing.

FOUQUET, NICOLAS, Vicomte de Melun and de Vaux, Marquis de Belle-Ile (1615-80). Superintendent of Finance under Louis XIV. He was born in Paris, January 27, 1615, the son of a French nobleman high in the confidence of Richelieu. Young Fouquet was educated for the civil service, and from 1642 to 1647 was attached as intendant to the Army of the North. He was then made Commissioner of Police, Justice, and Finance in Dauphiné, and held other important offices, until, in 1648, he was called to Paris as intendant for the municipality, and became involved in the political intrigues of the day. In 1650, through the influence of Mazarin, Fouquet was given the important post of Procureur-Général to the Parlement of Paris. His attitude during the Fronde had won him the regard of the Court, and of Anne of Austria in particular, and in 1653 he was made Superintendent of Finance with a colleague, Servien. His colleague died in 1659, leaving Fouquet alone in office. As chief Financial Minister, Fouquet set himself to work to reorganize the finances of France. Corruption and maladministration, together with heavy war expenses, had drained the treasury, and it is stated that the new Minister had at first to meet expenses by negotiating loans on his own credit. Mazarin soon became jealous of his protégé's influence, and after the Peace of the Pyrenees (1659) and the marriage of the King, an open breach took place in their relations, and henceforth each sought to overthrow the other. In his anxiety to be supreme, Fouquet overdid his part; and on the death of Mazarin, Colbert (q.v.) was consulted regarding the state of the finances, and secretly influenced the King against Fouquet. Meanwhile Fouquet had secured possession of the port of Belle-Ile, and had fortified it as a place of refuge. He also erected a magnificent château on

his estate at Vaux, and there, in August, 1661, he entertained the King with a magnificence and splendor hardly surpassed at Versailles. Louis XIV. would not be conciliated, however, and Fouquet would have been arrested in the midst of the festivities, but for the prayers and intercession of the Queen-mother, Anne of Austria, who was still his friend. There can be little doubt that the charges of maladministration and dishonesty brought by Colbert against Fouquet were substantially true, for the latter was forced to resort to speculation in order to keep up the almost royal state in which he lived. In an age, however, where every one connected with the royal treasury stole, it was Fouquet's only misfortune to be caught. He had been craftily persuaded to sell his office of Procureur-Général and so deprive himself of a trial before the Parlement of Paris. He was arrested at Nantes, in September, 1661, charged with malfeasance in office, to the detriment of the King, and with planning rebellion. His papers were seized and examined. After being moved from prison to prison, he was consigned to the Bastille, and in 1664 was adjudged guilty, after a very unfair trial, and was condemned to perpetual banishment, with confiscation of goods and property. This sentence the King changed to imprisonment for life, and Fouquet was sent to the fortress of Pignerol at the beginning of 1665. During his fifteen years' captivity he composed several works of a devotional nature. He died at Pignerol, March 23, 1680. During the height of his power Fouquet was a generous patron of art and literature, and was intimate with all the literary men of the day. He presented to the Bibliothèque Royale (now Nationale) 13,000 rare volumes which he had collected. He had, however, neither the breadth nor the statesmanship of his contemporary, Colbert. Consult: Cheruel, *Mémoires sur la vie publique et privée de Fouquet* (Paris, 1862); Lair, *Nicolas Fouquet* (Paris, 1890); Hassall, *Louis XIV. and the Zenith of the French Monarchy*, in the "Heroes of the Nations Series" (London, 1885).

FOUQUIER, fō'kyă', JACQUES FRANÇOIS HENRY (1838-1901). A French publicist, born in Marseilles. He studied law and medicine, traveled extensively, pursued a course in art at the Institute in Geneva, in 1861 entered journalism in Paris, and in 1867 was a war correspondent with Garibaldi in Italy. He held various administrative positions in the Department of the Interior, and after several unsuccessful attempts was elected, in 1889, a member of the National Assembly. He was connected editorially with *La Vraie République*, *Le Petit Parisien*, and *Gil Blas*, and in 1891 became the dramatic critic of *Figaro*. His publications include: *Etudes artistiques* (1859); *L'art officiel et la liberté* (1861); *Au siècle dernier* (1884); *La sagesse parisienne* (1885); and a successful play, with M. F. Carré, *Le roman d'une conspiration* (1890).

FOUQUIER-TINVILLE, tăn'vêl', ANTOINE QUENTIN (1747-95). The public accuser of the Revolutionary Tribunal during the Reign of Terror. He was born at Hérouel, in the Department of Aisne, practiced law there for some time, then came to Paris and turned police spy. On the outbreak of the Revolution he figured as one of the fiercest of democrats. By Robespierre he was appointed, first a member, then director and

public accuser, of the Revolutionary Tribunal. He performed the duties of his office with a bloodthirsty relentlessness that came partly from lack of feeling, partly from a brutalized conception of duty. Regarding himself as the servant of the Revolution—though he was in reality only the tool of the Committee of Public Safety—he denounced impartially men of all parties, and brought to the guillotine with equal fervor Bailly and Vergniaud, Danton and Hébert, Robespierre and Saint Just. After the passing of the Reign of Terror he was arrested, and in May, 1795, guillotined, dying bravely enough, and justifying his career in calling himself a blind instrument of the law. Consult Domenget, *Fouquier-Tinville et le tribunal révolutionnaire* (Paris, 1878).

FOURBERIES DE SCAPIN, fōōr'be-ré' de skā'pān', LES. A comedy by Molière (1671), based partly on the *Phormio* of Terence. There is an English translation by Otway (1677), under the title *The Cheats of Scapin*.

FOUR CANTONS, LAKE OF THE. See LUCERNE, LAKE OF.

FOURCHAMBAULT, fōōr'shān'bō'. A manufacturing town in the Department of Nièvre, France, 5 miles by rail from Nevers, near the right bank of the Loire (Map: France, K 4). It contains one of the most important iron-foundries in France, producing bridge materials, rails, car and locomotive wheels. Population, in 1901, 6152.

FOURCROY, fōōr'krwü', ANTOINE FRANÇOIS, Count de (1755-1809). A French chemist. He was born in Paris, the son of a druggist. He became a student of medicine, supporting himself by teaching and translating until 1780, when he received the degree of doctor of medicine. About this time he delivered a course of popular lectures on chemistry and natural history which gained for him a high reputation. Buffon, in 1784, secured his appointment as professor of chemistry at the Jardin du Roi, now Jardin des Plantes, which position he held for twenty-five years. Fourcroy was one of the early converts to the theories of Lavoisier, together with whom, and with Berthollet and Guyton de Morveau, he prepared the *Méthode de nomenclature chimique* (Paris, 1787). In 1792 he was appointed a Deputy to the National Convention; in 1794 he was made a member of the Committee of Public Safety, and in 1795 of the Council of Ancients. During the time of his service he endeavored to improve the system of public education, organized the Ecole Polytechnique, and instituted schools of medicine. Under Bonaparte he became Director-General of Public Instruction, in 1801. He was the author of *La philosophie chimique* (1792); *Système des connaissances chimiques* (11 vols., 1801); and of other works on chemistry, as well as numerous papers on chemical topics.

FOUR-EYED FISH. See ANABLEPS.

FOURIER, fōōr'ryā', FRANÇOIS MARIE CHARLES (1772-1837). A French socialist. He was born at Besançon, April 7, 1772, the son of a merchant, and educated in the college there. At the age of eighteen he entered a cloth business, although from his childhood he had shown an antipathy toward commerce on account of the deception and injustice he saw in it. He visited all

the large cities, not only in France, but in Holland and Germany, as a mercantile agent, thus gaining an opportunity for careful observation of social conditions. At his father's death he inherited 80,000 francs, and invested it at Lyons in colonial products. During the siege of Lyons, in 1793, all his property was destroyed; his bales of cotton were used as breast-works, his provisions were taken to feed the soldiers; and he was himself thrown into prison. Later he entered the army, but he was forced to resign on account of ill health. The rest of his life was spent in mercantile pursuits. In 1799, as agent for a great provision merchant, he had to destroy a large quantity of rice which had been held for higher prices so long that it had become unfit for consumption. The destruction of food needed by the poor made a lasting impression on his mind, and is said to have first turned his attention to social problems. His business enterprises did not prosper, and for the greater part of his life he was in straitened circumstances. His chief works were the *Théorie des quatre mouvements et des destinées générales*, published in 1808; the *Traité d'association domestique agricole* (1822), which contains his whole system, and was later republished under the title, *Théorie de l'unité universelle*; and *Le nouveau monde industriel ou invention du procédé d'industrie attrayante et combinée, distribuée en séries passionnées* (1829). Before his death he had a few followers, the most important one of whom was M. Just Muiron, who was converted to Fourierism in 1814. Fourier died October 10, 1837. After his death his party gained many adherents, among whom were some of the Saint-Simonians. A newspaper was published, and the 'Society for the Propagation and Realization of the Theory of Fourier' was established. See **FOURIERISM**.

FOURIER, JEAN BAPTISTE JOSEPH, BARON (1768-1830). A French geometer and physicist, born at Auxerre. He was the son of a poor tailor, and was left an orphan at the age of eight. The Bishop of Auxerre, recognizing his ability, placed him in a Church military school, where he soon showed a decided aptitude for mathematics. At the age of nineteen he wrote his memoir, *Sur la résolution des équations numériques de degré quelconque*, which was presented to the Academy in 1789. He took part in the Revolution, but in 1795 was sent as a student to the newly founded Ecole Normale, and soon after obtained the chair of analysis in the Ecole Polytechnique (1795-98). He went to Egypt in 1798 and was made perpetual secretary of the Institute of Cairo, and in the following year was placed at the head of one of the two scientific expeditions to the upper Nile. He returned to France in 1801 and was made (1802) Prefect of Isère, a position which he filled with his usual tact and energy. Napoleon created him a baron in 1808; but as, in 1814, he gave brief allegiance to the Bourbons, his political career was wrecked by the return of the Emperor from Elba. He was, after much difficulty, made a member of the Academy of Sciences in 1815, and succeeded Delambre (1822) as perpetual secretary for the mathematical sciences. He later became a member of the French Academy (1826). Fourier was one of the leading mathematical physicists of his time. His labors were divided between the study of the theory of

heat and of numerical equations. Among his leading works are the following: *Théorie analytique de la chaleur* (1822); *Analyse des équations déterminées* (posthumous, 1831); a memoir on statics (*Journal de l'Ecole Polytechnique*, 1797-98); and numerous memoirs on equations. His works, including references to numerous biographical sketches, were published by Darboux under the title, *Œuvres de Fourier* (Paris, 1889-90).

Fourier's Series, communicated by Fourier to the Academy toward the end of 1807, plays an important part in mathematical physics. Consult Du Bois-Reymond, *Zur Geschichte der trigonometrischen Reihen* (Tübingen, 1880).

FOURIERISM. This term is applied to the doctrines of Charles Fourier, and to the communistic movement inspired by Fourier's teaching. Fourier claimed to have discovered a mathematical basis for social organization. The chief difference between the social system which he advocated and those of his contemporaries, Saint-Simon and Owen, is found in the retention, for a time, at least, of private property and inheritance in Fourier's scheme. Fourier believed that man is capable of becoming perfect. His fundamental propositions were that the universe is governed by laws, and that man, by means of reason, can discover these laws and can apply them to the organization of society. When this shall be done, social harmony will reign, and unhappiness will be unknown. As yet, society is in its infancy. The different systems which the human race have established in the past have been only experiments, but each one has been superior to the one which it replaced. This development will continue until perfection is reached. The ideal, according to Fourier, has not been realized because our civilization is false—because the false sciences of ethics, economics, philosophy, and politics are followed instead of the true sciences—chemistry, physics, mathematics. The social organization outlined by Fourier is based on the *passions* or desires of man. There are twelve passions: five sensitive—seeing, hearing, smelling, feeling, and tasting; four affective—amity, love, paternity, and ambition; and three distributive—cabalistic, alternating, and composite. If all these passions are given free play, *passional attraction* causes the spontaneous formation of groups in society. The unit of society must be large enough to allow all the passions to operate freely in all possible combinations, and should therefore consist of about two thousand persons. Each group, or *phalanx*, should occupy a single building and provide itself with all the commodities and amusements desired. The chief occupations are agriculture, manufactures, commerce, domestic economy, art, science, education, and government. Within the phalanx the members are arranged in series and groups according to the law of *passional attraction*. Special corporations are organized for each branch of industry. Individuals enroll themselves for those occupations for which they have natural aptitudes, and are allowed to change from one to another as often as they please. Thus work yields only pleasure. Fourier expected that association would economize expenditure and effort to such an extent that a man would need to work only ten years of his life. Under his system salaries are abolished; each person receives

an ample minimum, and the surplus is distributed according to the amount of labor, capital, and skill contributed—five parts to labor, four to capital, and three to talent. There are no drones, since all the people are anxious to confer benefits upon society. Surplus products are exchanged between phalanxes. Industrial armies are sent out to prepare new lands for occupation. Government, so far as there is any, is republican, with annual election of officers. Since there is no discord, there are no soldiers, policemen, or criminals. At first Fourier expected society to become practically anarchistic, but later he found it necessary to map out a definite hierarchical scheme of government. The unit, of course, is the phalanx, which is ruled by a *unarch*. Three or four phalanxes form a union; three or four unions a district; a number of districts, a province. Nations, empires, caliphates, regions, continents, and finally a world unity are formed by similar combinations. The rulers, in hierarchical succession above the *unarch*, are called *duarchs*, *triarchs*, and so on, up to the *omniarch*, who rules the whole world. In addition to unity of government, there is unity of language, of weights and measures, of surveying. In fact, unity is one of Fourier's fundamental concepts. He maintained that the law of gravitation governs not only matter, but the other three movements—social, animal, and organic—as well. He found three indestructible principles—God, or spirit, the active and moving principle; matter, the passive principle; and justice or mathematics, the regulating principle to which reason corresponds. He expected great transformations to result from a social organization which would allow these natural forces to co-operate freely. Wild animals would willingly become man's servants, the North Pole would become habitable, sea-water would be as palatable as lemonade, and man would develop new organs, such as an eye in the back of his head. Fourier claimed that the human race will remain on this earth until a cycle of 80,000 years has been completed. The period of manhood is at hand. The race will continue to develop for 35,000 years, and then decline for 40,000 years.

After the death of Fourier, his party made a large number of converts in France, and many communities were formed to test his system. In every case where Fourier's suggestions were followed in detail the attempt failed. However, M. Jean Godin has founded at Guise a community where labor and capital are associated much after the plan of Fourier, but with many objectionable features left out. The establishment consists of iron, copper, sugar, and chicory factories, and has been very prosperous. In the United States the system has had little success. Fourierism was introduced in 1842 by Albert Brisbane and spread like an epidemic. No less than thirty-four associations were formed in all parts of the North and West, but few held out more than four or five years. The most notable of all was Brook Farm (q.v.).

Consult: Charles Pellarin, *Charles Fourier, sa vie et sa théorie* (Paris, 1843); Parisot, *Fourier, sa vie, ses œuvres*; E. Sambuc, "Considérations sur Charles Fourier," in *Archiv für Geschichte der Philosophie* (Berlin, 1900); Richard T. Ely, *French and German Socialism in Modern Times* (New York, 1883). For a literary

exposition of the ideals and plans of modern Fourierists, see Emile Zola's novel *Travail*.

FOUR LAKES. A chain of connected sheets of water in Wisconsin, emptying into the Catfish, a northeastern tributary of the Mississippi River (Map: Wisconsin, D 5). They are navigable for steamboats, and drain a beautiful country. The waters are clear and cold. Madison, the capital of the State, lies between Mendota and Monona, the two largest lakes. Their combined area is 230 square miles.

FOUR-LINED SNAKE. See CHICKEN-SNAKE.

FOURMIES, foor'mé'. A manufacturing town and railway junction, in the Department of Nord, France, 36 miles southeast of Valenciennes (Map: France, L 1). It contains numerous cotton and woolen mills and other industrial establishments. Population, in 1901, 14,083.

FOURNEL, foor'nél' FRANÇOIS VICTOR (1829-94). A French author, born at Cheppy, near Varennes, and educated at Verdun and Paris. He went into journalism in Paris, and was attached successively to the editorial staffs of *Le Français*, *Moniteur Universel*, and *Gaulois*. His publications include: *Les contemporains de Molière* (3 vols., 1863-76); *Curiosités théâtrales* (1859); *Esquisses et croquis parisiens* (1876); *Vacances d'un journaliste* (1876); *Voyages hors de ma chambre* (1878); *Aux pays du soleil* (1883); *L'ancêtre* (1881); *Figures d'hier et d'aujourd'hui* (1883); *De Malherbe à Bossuet* (1884); *Petites comédies rares et curieuses du XVIIIème siècle* (1884); *Les artistes français contemporains* (1885); *La confession d'un père* (1886), which was crowned by the Academy; *Maman capitaine* (1889); *Les hommes du 14 juillet* (1890).

FOURNET, foor'ná', JOSEPH JEAN BAPTISTE XAVIER (1801-69). A French geologist and meteorologist, born at Strassburg and educated at the School of Mines in Paris. He took part in several geological exploration expeditions, and in 1834 became professor of geology in the faculty at Lyons, which position he retained until his death. He was an authority upon the geology of the Alps and of southeastern France, and his original investigations were of considerable note, especially his discovery in connection with the sulphurization of metals, which was named from him 'Fournet's law.' He was a prolific contributor to various scientific publications and annals. Among his other publications were: *Géologie lyonnaise* (1862), and *Du mineur, son rôle et son influence sur les progrès de la civilisation* (1862).

FOURNIER, foor'nyá', AUGUST (1850—). An Austrian historian, born and educated in Vienna, where he served in the Ministry of the Interior, and in 1875 established himself as lecturer on Austrian history at the University. Appointed professor there in 1897, he was called in the same capacity to the University of Prague in 1883 and to the Polytechnic School in Vienna in 1899. As a member of the Reichsrat (1891-1900), and of the Bohemian Diet (1892-1901), he belonged to the German Liberal Party. Of his writings, *Napoleon I. Eine Biographie* (1886-89), which was immediately translated into French, is the most noteworthy. Besides many contributions to various periodicals, his other works include: *Gentz und Cobenzl Geschichte*

der oesterreichischen Diplomatie, 1801-05 (1880); *Historische Studien und Skizzen* (1885); *Handel und Verkehr in Ungarn und Polen um die Mitte des 18. Jahrhunderts* (1887); and *Der Kongress von Châtillon* (1900).

FOURNIER, CLAUDE (1745-1825). A French revolutionist, born at Auzon. He went to Haiti, and engaged in the manufacture of rum there, but his factory was burnt; he returned to France and was called for his stay in the New World *L'Américain*. He was active in all the great revolutionary days in the years 1789-92; was accused of plotting the murder of the Orleans prisoners who were killed while under his charge (1792), but was not found guilty; and, in spite of Marat's joining his accusers, was equally fortunate when accused of inciting insurrection. He was in the infernal machine plot of the Rue Saint Nicaise, was found guilty, and deported, and did not return until 1809. In 1811 he was again a conspirator and was sent to the Château d'If; was set free by the first Restoration, and was accused of a plot against the Bourbons after their second return, but set free again in 1816. He spent his last years in parading his royalist sentiments in hopes of a pension, but died a poor man.

FOURNIER, JEAN ALFRED (1832—). A French physician, specialist in skin diseases. He was born in Paris, and was a pupil of Ricord. He was interne in 1854, and in 1863 became physician at the Lourcine Hospital, where he began his studies and lectures on syphilis, on which he has written extensively. He became clinical professor in this branch at the University of Paris in 1880, and after four years at the Hospital Saint Louis.

FOURNIER, PAUL EUGÈNE LOUIS (1853—). A French jurist, born at Calais. He was educated at the Ecole des Chartes, and became professor of Roman law at Grenoble. He is considered an authority on canonical law, in which subject he has written the following important works: *Le Liber Tarraconensis*; "Études sur une collection canonique du XIe siècle" (in *Mélanges Julien Havet*, 1895); "Les collections canoniques attribuées à Yves de Chartres" (in *Bibliothèque de l'Ecole des Chartes*, 1896); *Joachim de Flore: Ses doctrines, son influence* (1900).

FOURNIER, PIERRE SIMON (1712-68). A French type-founder and author. He was born in Paris, and probably received his first instruction from his father, who was director of the foundry of Guillaume Le Bé. In 1736 he established his own foundry, the entire material for which he manufactured himself. Especially celebrated were his ornamented letters. He also contributed greatly to the improvement of musical type, which subject he discussed in a special work. He further had the distinction of publishing the first *Manuel typographique* (1764-66), a work which became exceedingly popular, and remained so long after the death of its author. Among his principal publications may be mentioned: *De l'origine et des productions de l'imprimerie primitive en taille de bois* (1759); and *Traité historique et critique sur l'origine et les progrès des caractères de fonte pour l'impression de la musique* (1765).

FOURNIER, TÉLESPHORE (1824-96). A Canadian jurist, born in Saint François, Quebec. He was educated at Nicolet College, and was

called to the bar of Lower Canada in 1846. In 1863 he was appointed Queen's Counsel. He was elected to the Canadian Parliament in 1870, and became a privy councillor in 1873. In the same year he took his seat as Minister of Internal Revenue in the Mackenzie Cabinet, was transferred to the portfolio of Justice in the summer of 1874, and from May to October, 1875, was Postmaster-General. In the latter month he was appointed a puisne judge in the Supreme Court of the Dominion of Canada, a court which he himself, while Minister of Justice, had organized, and he continued upon the bench until his death.

FOUR-PART WRITING. In music, writing for four different voices. It is the foundation of all composition. The student begins his studies by writing exercises and chorals for four voices, because thus he is enabled to employ all the intervals of a chord of a seventh; and in the case of triads he need only double the fundamental tone. Three-part and two-part writing require more skill, because some interval of a chord must be omitted. Four-part writing employs generally mixed voices, i.e. soprano, alto, tenor, and bass. But four-part compositions for female (two soprano, two altos) and male voices (two tenors, two basses) is also very common. Writing for mixed voices is easier because of the greater range within which the several intervals of a chord may be arranged. Here the composer has three octaves, from A to a², at his disposal, while in writing for male or female voices his range is practically limited to two octaves, from A to a¹ or a to a² respectively. See HARMONY.

FOUR P's, THE. The best-known of the interludes by John Heywood (about 1543). The Four P's are a Palmer, a Pardoner, a Potecary, and a Pedlar.

FOUR PRENTICES OF LONDON, THE. A chronicle play by Thomas Heywood, written about 1600, and printed in 1615 and 1632. It was attacked by Beaumont and Fletcher in *The Knight of the Burning Pestle*.

FOUR SONS OF AYMON, THE. See AYMON.

FOURTH. See INTERVAL.

FOURTH DIMENSION. See GEOMETRY.

FOURTH PARTY, THE. A name applied, about 1880 to an opposition group within the English Conservative Party, under the leadership of Lord Randolph Churchill (q.v.).

FOURTH STATE OF MATTER. See MATTER, Section *Theories of Matter*.

FOURTOU, foor'too', OSCAR BARDY DE (1836-97). A French legislator. He was born at Ribérac (Dordogne), and was educated at Poitiers. After acting as mayor of his native town, he was elected a member of the National Assembly in 1871. Thereafter he successively became Minister of Public Works (1872), Minister of Public Instruction (1873-74), and Minister of the Interior (1874 and 1877). He was identified with the Clerical Bonapartist Party, and as Minister of the Interior conducted a vigorous and aggressive campaign against the Republicans. He dismissed all prominent representatives of that party then holding office, and appointed Bonapartists to the positions thus vacated. Particularly aggressive was his attitude toward the Republican press, which for a time was subjected to a relentless persecution.

FOVILLE, fô'vel', ALFRED DE (1842—). A French political economist and statistician, born in Paris and educated at the Polytechnical School in that city. He served successively as auditor of the Council of State, chief of the Bureau of Statistics, and professor at the School of Political Science. In 1877 he became editor of the *Bulletin de statistique et de législation comparée*. His publications include: *Mémoire sur les variations des prix au XIXème siècle* (1872); *Atlas de statistique financière* (1881 and 1889); *La richesse en France et à l'étranger* (1893); *L'industrie des transports dans le passé et dans le présent* (1893).

FOWEY, foi. A seaport town of Cornwall, England, on the south coast, 22 miles west of Plymouth (Map: England, B 6). It is noted for its picturesque situation amid hill and cliff scenery, and is a favorite artist resort. It has a deep harbor, with a narrow entrance guarded by three forts, and in the thirteenth and fourteenth centuries was one of the chief seaports of England. Its principal industry is the pilchard fishery, and it has a considerable export trade in the chinastone and iron ore of neighboring quarries and mines. Population of parish, in 1891, 7020; in 1901, 7691.

FOWKE, GERARD (born SMITH) (1855—). An American archæologist and ethnologist, born in Maysville, Ky. For many years he was connected with the United States Bureau of Ethnology in investigations in the Eastern United States, and in the Ohio Valley. The results of his discoveries were published in the *Annual Reports* of the Bureau. In 1894 and 1896 he investigated the supposed Norse remains near Boston. Afterwards he was engaged in explorations on Vancouver's Island, and in 1898 explored the lower Amur River, Siberia, for the American Museum of Natural History, New York City.

FOWL (AS. *fugol*, OHG. *fogal*, Ger. *Vogel*, Goth. *fugls*, bird, fowl). A word commonly used now in a restricted application to useful birds, chiefly of the gallinaceous order. Thus, 'wild fowl' and 'water-fowl' mean those birds of land and water respectively in which sportsmen are interested, and 'barnyard fowl' are the domesticated kinds—poultry. When used in the singular, however, the word almost invariably signifies a full-grown domestic chicken.

DOMESTIC CHICKENS. Chickens are raised in the United States for their flesh, for the production of eggs, and as fancy stock for exhibition purposes. According to Howard there are 87 standard and a large number of promiscuous varieties of chickens raised in the United States, which have been divided into 10 classes. For practical purposes the 10 classes may be grouped into four general classes as follows: (1) General-purpose breeds, the American class; (2) meat or table breeds, the Asiatic class; (3) egg-making breeds, the Mediterranean class; (4) ornamental breeds, the Polish, exhibition games, miscellaneous, and bantam classes.

The *Plymouth Rock* is the most popular of all breeds of chickens for general purposes. It is of medium size, hardy growth, and good egg-laying qualities. The barred variety is the most generally known. It is of a grayish-white color, regularly crossed with parallel bars of blue-black running in straight distinct lines throughout the entire length of the feathers. The standard

weight of the cocks is nine and one-half pounds; and of hens, seven and one-half pounds. Other varieties of Plymouth Rock are very like the barred except in color. The *Wyandottes* are rated next to the Plymouth Rocks as general-purpose fowls. The *Light Brahma*, which became popular between 1850 and 1860, is the leading variety of the Asiatic class. The male is pure white in color excepting the hackle, tail, and flights, which are black, and white striped with black. The shanks are well feathered, with the feathering extending down to the middle toe. The *Brahma* female has a white head; hackle white, striped with black; cape white and black, completely covered by the hackle when the bird stands erect. The average *Light Brahma* male is 26 inches in height. The standard weight of the cock is 12 pounds; of the hen, nine and one-half pounds. The *Cochins* are second only to the *Brahmas* for edible purposes, weighing somewhat less than the *Light Brahmas*. There are several varieties of *Cochins*: Buff, partridge, black, and white. All have heavy leg and foot feathers. The *Leghorns* are the best known of the egg-producing varieties of the Mediterranean class. They mature early and feather quickly. The pullets often begin laying when four months old. There are a number of varieties of *Leghorns* which differ in color and in the form of comb, which in all cases is large and a distinguishing mark of the breed. The *Leghorn* cock has a graceful, round and plump body, broad at the shoulders and tapering toward the tail. The *Leghorn* hen in many respects resembles the cock in shape and carriage, and is even more graceful. The ornamental breeds vary greatly. Bantams are characterized by their small size; the silky fowls by their soft webless feathers, which when in prime condition are less fluffy and stand out from the body in all directions; and the *Yokohama* fowls by the great length of the tail and hackle feathers, the tail-feathers of the cock sometimes attaining a length of six feet or more. The *Games* are commonly divided into two distinct varieties—exhibition and pit. The exhibition game is long, lanky, close-feathered throughout and spare in tail-feathering. The pit is short, stout and stocky, with abundant tail-feathering, and for the farm and general purposes has always been considered a practical and profitable fowl. It is hardy, matures early, is a good layer, and its flesh is considered of exceptional value for the table, being fine-grained, tender, and sweet. The hens are splendid sitters and careful mothers. See Plate accompanying article POULTRY.

INDUSTRIAL CONSIDERATIONS. Chicken-raising, an important industry whether conducted as a special business or as a part of general farming, depends upon suitable houses and proper care and feeding. It is very desirable that chickens be provided with a house somewhat separated from the other farm buildings, but near enough to the barnyard so that they can spend a part of their time in scratching for and gathering up the many seeds and grains that would otherwise not be utilized. Poultry-houses need not be elaborate in their fittings or expensive in their construction. Material and construction will vary in different regions, but the houses should always be planned with regard to cleanliness and convenience. They should be cool in summer and warm in winter, and, when it is not desirable to allow poultry free range, the houses should be provided with yards or runs, because chickens need exercise.

Coops for young chickens are of various styles, some being very simple, and others provided with yards covered with netting to exclude hawks and cats. The poultry-house should be located upon soil which is well drained and dry. A gravelly knoll is best, but, failing this, the site should be raised by the use of the plow or scraper until there is a gentle slope in all directions, sufficient to prevent any standing water even at the wettest times. A few inches of sand or gravel on the surface will be very useful in preventing the formation of mud. A group of evergreens or other windbreak will be a decided advantage in sheltering the house from the north and north-west winds in the colder parts of the country.

The amount of space to be allowed per chicken depends upon the size of the fowls, whether a shed is attached to the house, and whether the fowls have free run of the open fields. For chickens in confinement there should be from six to fifteen square feet for each adult bird in case there is no shed attached to the house; with a shed this space may be reduced about one-half. The yards should be large enough to allow exercise in the open air, and to furnish more grass than the birds will eat. This will vary from 60 to 150 square feet per adult bird. An open shed facing the south is of great assistance in maintaining the health and productiveness of the flock. In it the birds can be induced to hunt for their food and take exercise in all seasons of the year, and where they can enjoy scratching and dusting themselves in the sunshine, even during the winter months. Chicken-houses provided with earth floors are frequently damp and unsatisfactory, and the cause of various poultry diseases. Cement floors are cold, and also more or less damp. According to D. A. Salmon, who is authority for many of the statements given here, a good cement floor laid on broken stone, and covered with a few inches of earth, would probably be satisfactory, if not too expensive. A board floor, six or eight inches above the earth, with good ventilation under it, is dry but too cold, except in the South. A double flooring, laid tightly with building paper between, or a good single flooring covered with a few inches of dry earth, is probably the best. In all cases of board floors there should be sufficient space beneath for ventilation, and to guard against lodgment of rats. Convenient roosts should be provided. They should be nearly flat or rounded slightly on the upper surface. Crevices in which vermin may hide should be avoided. Such precautions suffice in most cases to keep the poultry free from chicken-lice, the characteristics of which are given under LOUSE. The roosting-space allowed should be 6 to 8 inches for the small breeds, 8 to 10 inches for the medium, and 10 to 12 inches for the large breeds of chickens.

NESTS AND EGGS. Suitable nests are an essential requirement for egg-laying stock. The simplest form of nest is a box placed upon the floor of the poultry-house. With heavy fowls, which are apt to break their eggs in fighting away other hens that try to enter their nests when they are laying, and thus acquire a habit of egg-eating, a more concealed or dark nest may be necessary. Although on small farms, in towns, and in villages it is generally necessary to confine poultry in houses and yards, there are many large farms where poultry may be raised with the greatest economy by allowing them to range.

The large area at their disposal furnishes an exhaustive supply of insects and worms, and an abundance of water, seeds, and grains which chickens alone can utilize. Under such circumstances fowls take care of themselves so well, and are so energetic in seeking their food, that they are either forgotten, and allowed to shift for themselves when they really need attention and assistance, or they are regarded as a nuisance because they sometimes do a little damage. When fenced away from the garden and flower-beds, fowls do little damage, and cause scarcely any annoyance on a farm. On the other hand, they do an immense amount of good in the protection of crops by the destruction of injurious insects, larvæ, and worms, and are especially useful on fruit farms. Eggs are hatched under the hens or in incubators. Incubator chicks may be conveniently cared for in brooders or 'artificial mothers.' Many incubators and brooders have been devised which have been shown by experience to be satisfactory.

FEEDING. Chickens require a mixed diet of grain, animal food, and green or succulent materials. The food must also supply the lime and other mineral matters needed for egg-shells, and an abundance of grit, required for digesting food, is also essential. Pure water should at all times be provided. A number of forms of drinking-fountains have been provided to meet the latter requirements. When only a small flock of hens is kept, chiefly to provide eggs for family use, a mistake is frequently made in feeding too much corn. It has been shown by experiments that corn should not form a very large portion of the grain ration of laying hens, as it is too fattening, especially for hens kept in close confinement. Corn, no doubt because of its cheapness and abundance, has generally been considered in the United States to be the most valuable poultry food. In recent years, more than formerly, wheat has been fed and the poultry ration thereby improved. Wheat is preferable to corn, and oats are an excellent food, better, perhaps, than any other single grain, particularly if the hull has been removed. When comfortable quarters are provided, fowls kept for egg production should have a ration with a nutritive ratio of about 1:4. When poultry is fed for the production of flesh, the ration should contain more fat and carbohydrates in proportion to the protein; that is, it should have a wider nutritive ratio than the ration cited for egg production. For forcing fowls for egg production, as in forcing animals for a large yield of milk, the ration should be made up of a number of kinds of grain. Experiments have shown that fowls not only eat their food with better relish if it is composed of many kinds of grain, but that the proportion digested is larger than when made up of fewer constituents. The food consumed has an effect upon the flavor of eggs, and in extreme cases upon the odor also. Thus, onions when fed for a considerable time produce a noticeable flavor in eggs. The majority of poultry-raisers believe that ground food or soft food should form a part of the daily ration, and that it is desirable to feed soft food in the morning, as it will be digested and assimilated quicker than will whole grain. A mixture of equal parts by weight of corn-meal and ground oats added to an equal quantity of wheat, bran, and fine middlings is recommended as a satisfactory food if mixed

with milk or water. It should be thoroughly wet without being sloppy. The dry grain ration should consist largely of whole wheat with some oats and perhaps a little cracked corn. This should be scattered in the litter, which should always cover the floor of poultry-houses, in order that the fowls be compelled to seek the corn, and thus obtain a considerable amount of exercise. The litter also insures cleanliness. Straw, chaff, buckwheat hulls, and cut corn-stalks all make excellent litter. At night, just before the fowls go to their perches, they should have all the corn they will eat up clean. Some green food should be given to poultry, although perhaps it is not absolutely necessary. Clover, rape, cabbage, etc., are recommended for the purpose. Green food is especially desirable when chickens are kept in yards throughout the entire year.

FOWLS AS FOOD. The flesh of chickens is esteemed for its delicate flavor. The young chickens are often spoken of as broilers. For composition and food values of broilers and fowls, see tables under Food.

Chickens are ordinarily broiled or fried, roasted or baked, boiled or stewed, and are seasoned and garnished in many different ways. While delicate flavor and appetizing appearance contribute to the popular esteem in which poultry are held in all regions, there is an additional reason for their extended use in warm climates. This is the fact that poultry may be kept alive and killed as they are needed for the table; thus when means of cold storage are absent, the loss from spoiling may be much more readily avoided than is the case with larger animals used for food. It is commonly believed that the flesh of poultry is quite thoroughly and easily digested, and thus especially suited for the diet of invalids. The value of eggs as food and their place in the diet are discussed under the title Eggs.

BIBLIOGRAPHY. A very large number of books have been published on the general subject of poultry, among which are the following: Wright, *The Book of Poultry* (London, Paris, Melbourne, 1891); Watson, "Fowls, Care and Feeding," in *United States Department of Agriculture Farmers' Bulletin 41* (Washington, 1900); Howard, "Standard Varieties of Chickens," in *United States Department of Agriculture Farmers' Bulletin 51*, illustrated (Washington, 1900); A bibliography of *Poultry Literature*, *United States Department of Agriculture, Library Bulletin 18* (Washington, 1899); McGraw, "The Plymouth Rock," and "The Wyandotte," in *United States Department of Agriculture, Bureau of Animal Industry Bulletins 29 and 31* respectively (Washington, 1901); Salmon, "Poultry Raising on the Farm," in *United States Department of Agriculture, Bureau of Animal Industry, Bulletin 141* (Washington, 1900).

FOWL CHOLERA. A virulent infectious disease of poultry common in Europe and America, which takes the form of a septicæmia, and is due to a specific micro-organism. It was first studied in 1782, and was referred to anthrax. Chickens are especially susceptible, but it occurs also in geese, ducks, pigeons, and even rabbits. Three forms of the disease are recognized: the apoplectic, the acute, and the chronic. In the first form the bird becomes suddenly dull, the wings droop, the eyelids fall and the feathers are elevated, the comb soon

turns purple, the temperature rises to about 43° C., and death occurs within from two to five hours. In the second form the same symptoms appear with the addition of acute diarrhœa, but the bird afflicted may suffer from twelve to sixty hours or perhaps recover after the diarrhœa has persisted for about two weeks. In the chronic form a permanent or an intermittent diarrhœa is the most marked symptom, and death from extreme emaciation and exhaustion is postponed for some weeks.

The micro-organism may gain entrance to healthy birds through the mucous membranes of the eye, respiratory and alimentary tracts. The blood, all mucous and serous secretions, and excrementitious matter from affected birds are virulent; but when exposed to heat, fresh air, or direct sunlight, they become innocuous. The virus may be destroyed by a one per cent. solution of salicylic, benzoic, or carbolic acid. Healthy birds may be immunized by inoculation with attenuated virus or with serum from immunized birds. No medicinal treatment is of any avail in the apoplectic and acute forms. In chronic cases dilute acids sometimes assist the birds to recover. After an outbreak of this disease, the poultry quarters should be cleaned and disinfected. Healthy birds should not be allowed to run on the ground where diseased birds have been. Consult: Salmon, *Poultry Diseases* (Washington, 1899); Theobald, *Parasitic Diseases of Poultry* (London, 1896).

FOWLER. A libertine in Shirley's *Witty Fair One*, who is made to believe that he has died, and is atoning for his vices as a spirit.

FOWLER, CHARLES HENRY (1837—). An American clergyman of the Methodist Episcopal Church, born in Burford (Ontario), Canada. He graduated at Syracuse University in 1859, at the Garrett Biblical Institute (Evanston, Ill.) in 1861; entered the ministry of the Methodist Episcopal Church in the Rock River Conference in 1861, and held various pastorates in Chicago, Ill. From 1872 to 1876 he was president of the Northwestern University (Evanston and Chicago, Ill.), in 1876 became editor of the *Christian Advocate*, the leading periodical of the Methodist denomination in America, and in 1880 missionary secretary. In 1884 he was elected a bishop. He visited South America in 1885, and organized there a very efficient missionary work. Three years later (1888), on a tour of visitation around the world, he founded the Pekin University and the Nankin University in Central China, and organized the first Methodist Episcopal Church in Saint Petersburg, Russia. He further assisted in establishing the Nebraska Wesleyan University (University Place, Neb.), and greatly improved the condition of the Methodist Episcopal Church in San Francisco, Cal. He became favorably known as a preacher and occasional speaker, and won recognition as an able administrator. He wrote *Colenso's Fallacies* (1864).

FOWLER, ELLEN THORNEYCROFT (c.1873—). An English novelist, eldest daughter of Sir Henry Fowler, Secretary of State for India (1894-95). Miss Fowler lives at Woodthorne, Wolverhampton, Staffordshire. After publishing several volumes of mediocre verse, and a volume of short stories (*Cupid's Garden*, 1897), she at once gained popularity by a clever society novel en-

titled *Concerning Isabel Carnaby* (1898). It has been followed by *A Double Thread* (1899); *The Farringtons* (1900); *Sirius and Other Stories* (1901); a volume of poems entitled *Love's Argument* (1900); and *Fuel of Fire* (1902).

FOWLER, FRANK (1852—). An American figure and portrait painter, born July 12, 1852, in Brooklyn, N. Y. He was educated by private tutors and at the Adelphi Academy in that city. After leaving school he studied for two years in Florence, Italy, under Edwin White. From Florence he went to Paris, where he studied for seven years under Carolus Duran and Cabanel, and at the Ecole des Beaux-Arts. He rendered valuable assistance to Duran on the fresco of Marie d' Medici at the Luxembourg. He has painted a number of public men, notably Governors Tilden and Flower, also Archbishop Corrigan, Charles A. Dana, and others. He received medals at Paris and Atlanta. He has written a large number of articles on art topics for the magazines, and a book, *Portrait and Figure Painting*, besides various text-books on drawing and portrait painting. His technique is broad, with a fresh and delicate treatment, and he gives a faithful rendering of his subjects, with a poetic and imaginative conception.

FOWLER, HAROLD NORTH (1859—). An American classical philologist, born at Westfield, Mass. He received the degree of A.B. from Harvard University in 1880, and Ph.D. from Bonn in 1885. He was professor of Greek in the University of Texas, 1892-93, and in the College for Women, Western Reserve University, from 1893; was associate editor of the *American Journal of Archaeology*, and editor of Thucydides, book v. (Boston, 1888), and of Plautus's *Menæchmi* (Boston, 1889), etc.; and is the author of various philological papers and reviews.

FOWLER, HENRY HARTLEY (1830—). An English statesman, born at Durham. He was a Liberal member of Parliament for the undivided Borough of Wolverhampton from 1880 to 1885, when he was returned for the East Division. At the close of the Gladstone Administration of 1880 he was Under-Secretary at the Home Office (1884-85). He became Financial Secretary to the Treasury and a privy councillor in 1886, and from 1892 to 1894 was president of the Local Government Board, in which office he carried through Parliament the Parish Councils Bill. In 1894-95 he was Secretary of State for India, and in the latter year was knighted.

FOWLER, SIR JOHN (1817-98). A British hydraulic and railway engineer. He was born in Sheffield, England, and after engaging in various important works, he became acting engineer in the construction of the Stockton and Hartlepool railways. At the age of twenty-seven he was selected as engineer for the construction of the large group of railways known as the Manchester, Sheffield, and Lincolnshire. Having settled in London, he was continuously employed in the laying out and construction of railways and docks, and in the improvement of rivers and reclamation of lands from the sea. He designed and constructed the Metropolitan Underground Railway of London; with Sir Benjamin Baker designed and constructed the great Forth bridge (1890); was for many years consulting engineer to the Egyptian Government, and was made a baronet in 1890.

FOWLER, LORENZO NILES (1811-96). An American phrenologist and lecturer, the brother of Orson Squire Fowler (q.v.). He lived in England in 1863-96. Besides works which he wrote jointly with his brother, he published: *Synopsis of Phrenology and Physiology* (1844); and *Marriage, its History and Philosophy, with Directions for Happy Marriages* (1846). He was also concerned in the publication of the *American Phrenological Journal*, and the *Water Cure Journal*, afterwards called *Science of Health*.

FOWLER, ORSON SQUIRE (1809-87). An American phrenologist. He was born in Cohocton, Steuben County, N. Y., and was educated at Amherst College, where he graduated in 1834. While studying mental philosophy at college he became interested in phrenology, to the study of which he devoted all his spare time. After graduating he settled in New York, where, in conjunction with his brother Lorenzo, he began writing and lecturing on phrenology. In 1836 he published his first book, *Phrenology Proved, Illustrated, and Applied*, and in 1838 he founded the *American Phrenological Journal*, which he edited until 1865. During the rest of his life he spent the greater part of every year lecturing on phrenology throughout the United States and Canada. Before the Civil War he was an ardent abolitionist, and later became much interested in temperance work. He was the founder of practical phrenology in the United States. Among his numerous published works are: *Memory and Intellectual Improvement* (1841); *Physiology, Animal and Mental* (1842); *Matrimony, or Phrenology Applied to the Selection of Companions* (1842); *Self-Culture and Perfection of Character* (1843); *Hereditary Descent, Its Laws and Facts Applied to Human Improvement* (1843); *Love and Parentage* (1844); *The Self-Instructor in Phrenology and Physiology* (1849); *Sexual Science* (1870); and a number of other works in collaboration with his brother.

FOWLER, THOMAS (1832-). An English educator and philosopher, president of Corpus Christi College, Oxford. He was born in Lincolnshire, and was educated at King William's College, Isle of Man, and at Merton College, Oxford, where he graduated in 1854. In 1855 he became a fellow and tutor of Lincoln College, Oxford. He won the Denyer Theological Essay prize in 1858, was made select preacher in 1872, and was elected professor of logic in 1873. This chair he occupied until 1888, becoming meantime (1881) president of Corpus Christi College. From 1899 to 1901 he was vice-chancellor of the University of Oxford. His publications include: *The Elements of Deductive Logic* (1867, 10th ed., 1892); *The Elements of Inductive Logic* (1870, 6th ed. 1892); *Locke*, in "English Men of Letters" (1880); *Bacon's Novum Organum* (1889); *Locke's Conduct of the Understanding* (3d ed. 1890); *Francis Bacon* (1881) and *Shaftesbury and Hutcheson* (1882), in "English Philosophers Series"; *History of Corpus Christi College* (1893); *Progressive Morality: An Essay in Ethics* (1895). He was also joint author with J. M. Wilson of *Principles of Morals* (1885-87).

FOWLER'S SOLUTION. See ARSENIC.

FOWLING. See HUNTING.

FOX (AS. *fox*, OHG. *fuhs*, Ger. *Fuchs*, fox, Goth. *fauhō*, vixen; possibly connected ultimately

with Skt. *puccha*, tail). A member of a group or 'alopecoid series' of canine animals, more easily distinguished from the wolves, dogs, or jackals of the same family (Canidæ) by outward appearance than by zoölogical differences. They are, in general, of smaller size and less proportionate height; have longer hair, usually more reddish or yellowish than gray; larger, more triangular and furry ears; a more slender pointed muzzle, with straighter jaws; and a longer and more bushy tail, than their allies. Some zoölogists refuse to separate them even as a genus, but most students place them in the genus *Vulpes*, and still further separate the American gray fox as *Urocyon*, and the little African long-eared foxes as *Fennecus*. The anatomical characters upon which *Vulpes* is distinctly based are principally found in the skull, where "the bony projection forming the hinder border of the socket of the eye is regularly curved downward and has a convex upper surface" in the wolves and jackals; "whereas in the fox the same process is hollow above, and has a more or less marked tendency to curve upward behind"; also, the air-chambers in the frontal bones of the wolves are absent in the foxes. Another constant distinction is found in the pupil of the eye, which, when contracted, is round in the dog-like canines and elliptical in the foxes. The true foxes (apart from the African fennecs) are scattered throughout all the northerly regions of the world, from the edge of the tropical zone to the highest Arctic lands, but none are known in the Southern Hemisphere. The number of species is indeterminate, conservative naturalists regarding as local varieties various forms to which others give specific names.

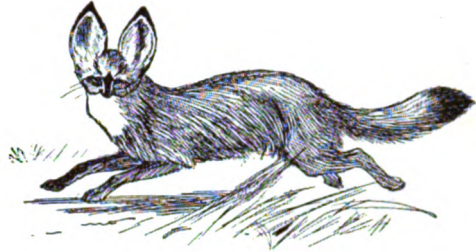
All inhabit holes in the earth, usually of their own digging, but do not hibernate, are nocturnal, and subsist mainly upon animal prey which they capture by stealthy approach and a quick rush; and all utter yelping cries, and breed annually. They are believed not to have contributed in any appreciable degree to the ancestry of any race of domesticated dogs, and although everywhere highly intelligent in their field of thought, are rarely tamed as pets or trained to perform tricks well. The typical and best-known species is the European red fox (*Vulpes vulgaris*), the hero of British fox-hunting (see FOX-HUNTING), and the *renard* or *Reinecke Fuchs* of European folk-lore. (See Colored Plate of CANIDÆ.) It is spread over the whole of Europe and Asia, and is also found in Asia Minor and along the south shore of the Mediterranean. The ordinary type, familiar in Great Britain and western Europe, is reddish brown above and white below, with the outer portions of the ears and feet black, and the tip of the 'brush,' or tail, white. Its length may vary from 27 to 46 inches, exclusive of the tail, which is itself from 12 to 15 inches long. Colors and markings vary greatly, however, as well as size and proportions. The habits of the common fox in England are thus sketched by Lydekker and Bell, and the essential facts apply to the animal in all parts of its range:

"Although the fox is by no means averse to taking possession of the deserted burrow of a rabbit or a badger, it generally excavates its own 'earth,' in which it spends a considerable portion of its time. As all hunters know, foxes frequent-

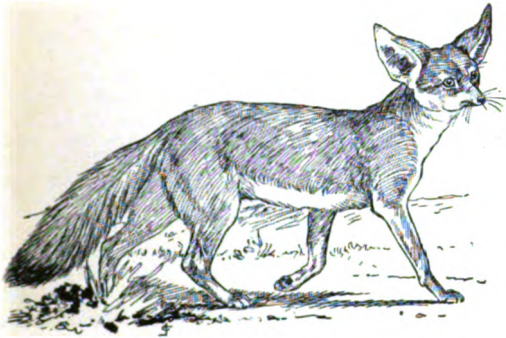
FOXES AND JACKALS



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6

1. KIT FOX (*Vulpes velox*).
2. LALANDE'S FOX-DOG (*Otocyon Lalandii*).
3. FENEC (*Canis zerda*).

4. CORSAC (*Canis corsac*).
5. GRAY FOX (*Urocyon cinereo-argentatus*).
6. JACKAL (*Canis aureus*).

ly prefer to live out in the woods, those with a northern aspect being, it is said, generally avoided. Sometimes these animals will prefer a thick hedgerow or a dry ditch, while we have known them to select the tall tussocks of coarse grass in swampy meadows as a resting-place; and they have also been found in straw-ricks, where it is on record that in one instance cubs have been born. The breeding time is in April, and the usual number of young in a litter is from four to six. The prey of the fox consists, writes Bell, 'of hares, rabbits, various kinds of ground birds, particularly partridges, of which it destroys great numbers; and it often makes its way into the farmyard, committing sad havoc among the poultry. It has been known not infrequently to carry off a young lamb. When other food fails, the fox will, however, have recourse to rats and mice, and even to frogs and worms; while on occasion beetles are largely consumed, and on the seashore fish, crabs, and mollusks form a part of its diet. Carrion seems never to come amiss, while the old story of the fox and the grapes alludes to the fruit-eating propensities of these animals.' The usual cry of the fox is a yelping bark. The well-known scent of the fox is secreted by a gland situated beneath the tail. The cunning exhibited by English foxes in escaping from hounds has been so often described that we shall make no further allusion to it here, beyond saying that it has probably attained its present development as the result of the inherited experience of many generations. The life of the fox is a precarious one; the huntsman is his friend and the gamekeeper his foe; and were he not specially protected for the sport he gives to hounds and men, he would, like the wolf, have long since been extinct in England. That the fox is an ancient inhabitant of the British Islands is proved by the occurrence of its fossilized remains in caverns in company with those of the mammoth and other extinct animals. This, however, is not all, for a skull . . . has been dug up from the sands lying at the top of the Red Crag of Suffolk, which are vastly older than the mammoth period."

As the Old World fox is traced eastward distinct local varieties are encountered, which, however, intergrade. Thus a black-bellied fox is characteristic of southern Europe, and is decidedly different from the ordinary colors of the North African variety. The dry plains of western Asia support a paler form, and this is succeeded eastward by two much larger types of the eastern and western Himalayas, which, in winter, when the coat is long and the colors are heightened, are extremely handsome; a characteristic marking among these is a dark stripe athwart the shoulders. Siberia, China, and Japan likewise have varieties of this same one species, which, if the American red fox be also included, ranges throughout almost the entire Northern Hemisphere, and has the most extensive distribution of any of the Canidæ. Asia possesses some other very distinct species of foxes, nevertheless, of which the most familiar is the small, alert, and pretty Indian fox (*Vulpes Bengalensis*) to be met with all over Hindustan, except in thickly forested regions. It is rarely hunted by scent, with foxhounds; but frequently affords good sport by coursing with greyhounds. Three other

species of 'desert' foxes, all pale and yellowish in hue, belong to the open sandy plains and tablelands between Arabia and Afghanistan. One of these is the widely spread desert fox (*Vulpes leucopus*); another, the better-known corsac (q.v.), and the other varieties inhabit Thibet and Afghanistan. The earliest fossil remains of distinctly canine beasts are fox-like animals of the Middle Tertiary period.

AMERICAN FOXES. Several species of fox are characteristic of North America. The most widespread and conspicuous is the red fox, called by American zoölogists a distinct species (*Vulpes Pennsylvanica*), but regarded by European students as a local phase of the circumpolar 'common' fox, heretofore described. It is hard to distinguish it in the normal type from the European fox, though the colors are, on the average, rather brighter; and it varies on our continent quite as diversely as does the fox of the Old World. The normal red fox remains common in spite of the civilization of the country throughout the eastern United States and Canada, westward to the Plains, as far south as northern Georgia; and reappears west of the Rocky Mountains and thence to the Pacific Coast in a paler large-tailed form. In the far north occur more rarely two other varieties—the cross fox and the silver fox. The former is simply a more or less normal red fox, marked sometimes strongly, sometimes indefinitely, with a dark cross on the back and shoulders, fine specimens of which are given a superior value by traders in peltries. The latter, or silver fox (var. *argentata*), is much rarer, and is black, with a silvered or hoary appearance due to many of the hairs being tipped with white; the tail is black with a white tip, and the soles of the feet are hairy, fitting it for life amid ice and snow. Good pelts of the silver fox are extremely valuable. That both these are merely phases of the red fox is plain from the fact that they may be born in the same litter with normally red cubs. Foxes totally black also occur frequently in the Hudson Bay region. The American red fox had originally much the same habits as those of the European animal, seems to be deserving of quite as much credit for sagacity and acuteness, and has learned to accommodate itself as well to the exigencies brought by civilization and the chase. The writings of American naturalists and sportsmen abound in interesting stories of its alertness, ingenuity, and adaptiveness, and show that it has spread and survived in the United States, where the gray fox has diminished.

A small grayer species of the southern California coast (*Vulpes macrotis*) is conspicuously distinguished by its great ears.

The Kit, Swift, or Burrowing Fox (*Vulpes velox*) is a well-marked species of the dry plains of the United States, whose range extends from Colorado and Nebraska north to the Saskatchewan Valley. It is small, only about 20 inches long, slender and compact in form. Its color is yellowish-gray on the upper surfaces, fading through reddish to white on the belly and legs, and there is a black patch on each side of the muzzle. The ears are short and densely furred, and the soles of the feet are overgrown with long woolly hair, like those of the Arctic fox. It digs burrows with skill and speed, feeds upon small rodents, insects, small birds and their eggs, etc.,

and is remarkably swift of foot and dexterous in hiding. Its fur becomes thick in winter and pale gray in color, rendering it nearly invisible. See Plate of FOXES AND JACKALS.

The Blue or Arctic Fox (*Vulpes lagopus*) is one of the most interesting of all the species. It is known all around the Arctic shores, and in summer is a variable brown (even sooty in some cases) on the upper parts, and yellowish-white on the ventral surfaces, throat, etc.; the under fur, however, is everywhere dull blue. This bluish tint frequently appears in the summer dress in patches in the foxes of all regions; but in those of the Aleutian Islands and southeastern Alaska it characterizes the whole pelage, and gives the name 'blue' fox to the animal in that region. E. W. Nelson, who describes it at length in his *Natural History of Alaska* (Washington, 1887), concludes that this is the typical, original form, from which the brownish and blackish foxes elsewhere are variants. The blue foxes remain of that color all winter, putting on a longer, thicker coat as cold weather approaches; but elsewhere all the Arctic foxes become purely white about October, and remain so until spring, rendering them almost invisible upon the snow and aiding them to steal upon their prey. They are animals of the open country and seacoast, and in winter they often visit the Eskimo villages or come close to their camps, and are easily trapped. "Parts of the country," says Nelson, speaking of Alaska, "where rocky ledges occur, are especially frequented by them, as the crevices among the rocks give them welcome shelter. During summer they fare sumptuously upon the breeding waterfowl, eggs, and young birds, which are found everywhere, but in winter comes harder work, and the ground is carefully searched for stray mice, lemmings, or an occasional ptarmigan. In early spring, toward the end of March, when the seals begin to haul up on the ice and the first young are born, thousands of these foxes go out seaward and live upon the ice the rest of the season. The young seal's offal, left by hunters and from other sources, gives them more food there than the shore affords at this time." It may be added to this that Feilden, who was with the Polar expedition of Nares, *A Voyage to the Polar Sea* (London, 1878), found that in Grinnell Land these foxes subsisted in winter largely upon stores of frozen lemmings, etc., which they had hidden in crevices or rocks or had buried in the ground. The fur of this fox is very valuable, and most of all that of blue foxes of the Aleutians, where they are now to a certain extent protected, not only, but where they have been colonized upon certain islands, and are being bred and provided with food as a regular fur-raising industry. See ALASKA; and Colored Plate of CANDÆ.

The Gray Fox is a species (*Urocyon argenteus*) of the United States, which is generally separated from other foxes by cranial peculiarities, and by the fact that the tail has a concealed mane of stiff hairs. The general coat is silver-gray above and whitish on the under parts, but the chin and a patch on the nose are black, and the base of ears, patch at side of neck, collar on throat, interior surface of fore legs, and a broad band along the belly are cinnamon rufous. The size is about the same as that of the red fox, but the hair is stiffer and less admirable as a

pellet. This species is generally distributed over the United States, but in the West differs locally so much from the Eastern type that no less than five subspecies have been named. It is accustomed to life in the forests rather than in open country, and has unusual ability in tree-climbing; but it seems to be less adaptive than the red fox, and has almost disappeared from the thickly settled and much-cleared Northern and Eastern States. See Plate of FOXES AND JACKALS.

Consult: for Old World foxes, Bell, *British Quadrupeds* (2d ed., London, 1874); Mivart, *Monograph of the Canidæ* (London, 1890); Brehm, *Thierleben* (Leipzig, 1876), English translation by Pechnel-Loesche and Haacke (Chicago, 1894-96); Blanford, *Fauna of British India: Mammalia* (London, 1889-91); and general works. For American foxes, Richardson, *Fauna Boreali Americana* (London, 1829); Audubon and Bachman, *Quadrupeds of North America* (New York, 1851); Merriam, *Transactions of the Linnæan Society of New York*, vol. i. (New York, 1882); Burroughs, *Winter Sunshine* (New York, 1876); Cram, *Little Beasts of Field and Wood* (Boston, 1889); and general works upon Alaska and the Arctic Coast.

FOX, or MUSKWAKI. An Algonquian people, best known as confederates of the Sauk (q.v.). They were called foxes (*Kenards*) by the French, possibly because of having a Fox clan; but call themselves Muskewakiuk, 'red-earth people.' When first known they lived in central Wisconsin, having been driven from Lake Superior by the Ojibwa, whose continued inroads, together with a disastrous war with the French, finally compelled them to incorporate about 1760 with the Sauk, with whom they have ever since been so intimately connected that the two tribes are now practically one, their combined population being about 930.

FOX, THE. See VOLPONE.

FOX, CAROLINE (1819-71). An English diarist. She was born at Falmouth, of a Quaker family that for two centuries had been prominently identified with Cornwall. Her father, Robert Were Fox, was the inventor of the deflector dipping needle, and his genial qualities drew around him many famous persons of his day. Miss Fox has graphically sketched their character and conversations in her posthumous *Memoirs of Old Friends, Being Extracts from the Journals and Letters of Caroline Fox* (1882). Especially interesting are the accounts of the conversations between John Stuart Mill and her brother, Barclay Fox. Her portraiture is characterized by appreciativeness and sympathy, while her style is almost uniformly buoyant and entertaining.

FOX, Sir CHARLES (1810-74). An English engineer. He was born at Derby, and after serving as apprentice to Captain Ericsson, entered the service of Robert Stephenson. He was subsequently a member of the firm of Fox, Henderson & Co., and after 1857 confined himself to private practice as consulting engineer. The numerous works designed and constructed by him include the tunnel at Watford, the railroad between Camden Town and Euston Square, the bridges over the Thames, the Shannon, and the Saône at Lyons. He was one of the principal railroad builders in Great Britain, and also constructed

roads in Denmark, France, Switzerland, Canada, South Africa, and India, where he introduced the narrow gauge. The introduction of the switch in place of the sliding rail previously in use is also due to him. He also built the Crystal Palace in London.

FOX, CHARLES JAMES (1749-1806). A celebrated English statesman and orator. He was the second son of Henry Fox, first Lord Holland, and Lady Georgiana Carolina, who was the eldest daughter of the Duke of Richmond and the great-granddaughter of Charles II. He was born on January 24, 1749, was educated at Eton and Oxford, and his education was completed by two years of travel on the Continent.

On his return to England in 1768, although he was not yet of age, he was returned to Parliament through the influence of his father, beginning his career as a Tory. His talent as a debater won him a place in Lord North's Ministry, which he entered in 1770 as Junior Lord of the Admiralty. In 1773 he was made a Lord of the Treasury, but was dismissed in the following year because of his opposition to the King's favorite marriage bill and a useless humiliation inflicted upon Lord North. The years that followed may be described as a conflict between the King, through his Minister, Lord North, and the brilliant Fox. He was the most formidable opponent of the war with America, even foreseeing the necessity and advantages of a complete separation. On the downfall of Lord North in 1782, notwithstanding the King's opposition, he was made Foreign Secretary in the Whig Ministry of Rockingham. He supported Pitt's motion for Parliamentary reform, and granted to Ireland complete legislative independence. His masterful plan for the separation of French and American interests in the peace negotiations of Paris was circumvented by Shelburne, the Home Secretary. As a consequence he resigned his office when Shelburne became Premier on the death of Rockingham. Forming a coalition with Lord North and the Tories, he defeated Shelburne and resumed his old position as Foreign Secretary, but the personal influence of the King secured the rejection by the Lords of his East India bill, which vested the government of India in a commission appointed by Parliament.

What may be called the second period of the Parliamentary career of Fox was occupied by his long struggle with Pitt. He alone, of all the famous English statesmen of his day, favored the French Revolution, and was opposed to the ruinous wars with France. The total abolition of the slave trade, the removal of the political disabilities of both the Dissenters and the Catholics, were repeatedly urged by him. He gave powerful aid in the impeachment of Warren Hastings, and in 1792 he secured the passage of his Libel Act, which as a measure for personal liberty is second only to the Habeas Corpus Act in importance. When Pitt died (1806), Fox became Foreign Secretary in the Ministry of All the Talents; but he did not live to see either the slave trade abolished or his peace negotiations with France carried out. He died in his fifty-eighth year, on September 13, 1806.

Fox was better qualified to lead an opposition than to govern an empire, for he lacked the tact and self-restraint necessary for managing Parliamentary majorities and conciliating a headstrong

king. He was one of the most brilliant and interesting figures of the eighteenth century. He had the vices of his day, but these were counterbalanced by his unfailing honesty and genial and kindly disposition. His vices he owed in a large measure to his father, a notoriously corrupt politician who deliberately made of him a gamester. He did not allow the faults of his private life to interfere with the strict performance of his Parliamentary duties, and whenever he was in office he relinquished them altogether. He was a man of fine literary taste, and among his friends were the poet Rogers, Gibbon the historian, and Dr. Johnson. Of his own literary efforts, the most important was a *History of the Reign of James II.* (1808), left incomplete at the time of his death. The work is of little value from either a scientific or a literary standpoint.

Consult: Wright, *Speeches of the Rt. Hon. Charles J. Fox in the House of Commons* (London, 1815); *Memorials and Correspondence of Charles James Fox*, edited by Lord John Russell (London, 1853), being materials collected by Lord Holland, his favorite nephew; Lord John Russell, *The Life of C. J. Fox* (London, 1859-66); Walpole, *Recollections of the Life of Fox* (London, 1806); Trevelyan, *Early History of Charles James Fox* (New York, 1881); Trotter, *Memoir of the Latter Years of Fox* (Baltimore, 1812); Wakeman, *Life of Charles James Fox* (London, 1890), in the Statesmen Series; Lecky, *History of England in the Eighteenth Century*, vols. iii.-vi. (London, 1882-87).

FOX, EDWARD, Bishop of Hereford (1496-1538). An English ecclesiastic, born at Dursley, Gloucestershire, and educated at Eton and at King's College, Cambridge. He became secretary to Wolsey, who sent him as an envoy to Rome (1528), for the purpose of gaining Papal sanction to Henry VIII.'s first marriage. Brought thus into royal notice, Fox was sent upon numerous diplomatic errands to France and elsewhere, and rose rapidly in his profession till he became Bishop of Hereford (1535). He was the main mover in Henry's divorce of Catharine and marriage with Anne Boleyn, and was regarded as a pillar of the Lutheran faith. He is credited with the epigram, "The surest way to peace is a constant preparedness for war," and his most important work is *De Vera Differentia Regiæ Potestatis et Ecclesiæ* (1534), of which an English translation was made in 1548.

FOX, GEORGE (1624-91). The founder of the Society of Friends, or Quakers. He was born at Fenny-Drayton, Leicestershire, July, 1624. His parents were in good circumstances, but it is doubtful if he had any schooling. He was apprenticed to a shoemaker; but when about nineteen came to believe himself the subject of a special divine call and took to wandering in solitude through the country, absorbed in religious reveries. His friends induced him to return home; but he stayed only a short time, and finally adopted the career of an itinerant religious reformer. About 1646 he left off attending church for worship. His first efforts at preaching were made at Dukinfield, Cheshire, in 1647, and at Manchester. He first attracted general attention in 1649, by rising in the principal church at Nottingham during the sermon and rebuking the preacher for declaring the authority of the Scriptures to be the source of

divine truth. "No," cried Fox, "it is not the Scriptures; it is the Spirit of God." This audacious act led to his immediate imprisonment. On his release he repeated his protests elsewhere. The excitement caused was very great, and Fox was frequently imprisoned as a disturber of the peace. He gained followers, who first received the name Quakers in 1650. According to Fox's *Journal*, it was given by Justice Bennet, of Derby, because Fox had bidden the magistrates to "tremble at the word of the Lord." In 1655 he was examined in London before Cromwell, who pronounced his doctrines and character irreproachable. Nevertheless he had a hard struggle, was constantly vilified, and frequently imprisoned by country magistrates. His followers increased in large numbers. They were naturally visionaries, mystics, and fanatics, and their extravagances did much to bring the body and its founder into discredit. It is no small item in Fox's favor that he succeeded in moderating their excesses and introducing discipline and organization among them. He had much help from Margaret, widow of Judge Fell, of Swarthmoor Hall, Lancashire, whose house became the headquarters of the Quaker movement. Although ten years older than Fox, they were married in 1669. Fox traveled unremittingly, preaching his doctrines. In 1671-72 he visited the West Indies and the continent of North America, and twice he went to Holland. Of his many imprisonments, the longest was at Lancaster and Scarborough, in 1663-66, and the last in Worcester jail, for nearly fourteen months, in 1673-74. He died in London, January 13, 1691. Fox was not a man of broad and philosophic genius, and his writings are marked by a poverty of intellect and sentiment. He won his success by earnestness and persistence, continually insisting upon a few leading doctrines, such as the futility of learning for the work of the ministry, the presence of Christ in the heart as the 'inner light,' the necessity of trying opinions and religions by the Holy Spirit, and not by the Scriptures, and the doctrine of 'non-resistance.' He was a man of winning personal manners and strong and sound moral nature. His peculiarities of dress have been exaggerated, and were adopted from a desire for simplicity rather than eccentricity. The fullest collection of his writings is the Philadelphia edition, in eight volumes (1831). The best known is his *Journal* (1634; new ed. 1902). Consult: Tallack, *George Fox, the Friends, and the Early Baptists* (London, 1868); Bickley, *George Fox and the Early Quakers* (London, 1884); Smith, *Descriptive Catalogue of Friends' Books* (London, 1867); Beck, Wells, and Chalkley, *Biographical Catalogue* (London, 1888). There are many biographies, among which those of Marsh (London, 1847), Jenney (Philadelphia, 1853), and Watson (London, 1860) may be mentioned. See FRIENDS.

FOX, GEORGE L. (1825-77). An American comedian, born in Boston. He made his first appearance at the Tremont Street Theatre, in that city, at the age of five. Soon after his arrival in New York, where he played for some time at the National Theatre in Chatham Street, he became popular as a low comedian. In the Civil War he served as a lieutenant in the Eighth New York Infantry. Inspired by the famous Ravel Brothers to undertake pantomime, he created a

distinct place for that kind of entertainment in New York City, first at the National Theatre and later at the New Bowery, of which he was for a time lessee and manager. His principal rôle was that of the clown in *Humpty Dumpty*, and no one has ever equaled him in this character, which he may be said to have created. He was scarcely less distinguished in his burlesques on the famous tragedians of the day, and his resemblance to Booth in the character of Hamlet was remarkable.

FOX, GUSTAVUS VASA (1821-83). An American naval officer. He was born in Saugus, Mass., entered the United States Navy as a midshipman in 1838, served eighteen years, participating in the war with Mexico, and retired with the rank of a lieutenant in 1856. He was engaged in the wool-manufacturing business at Lawrence, Mass., from 1856 to 1861. Early in the latter year he was consulted by General Scott in regard to sending a relief expedition to Fort Sumter, and an expedition was actually planned; but President Buchanan refused to allow the plan to be carried out. After the inauguration of Lincoln, however, it was put into operation. Fox was first sent to confer with Major Anderson, and upon his return was commissioned to fit out a relief expedition at New York. Fox, with part of his ships, arrived off Charleston Harbor on the morning of the bombardment; but through an order which had detached the principal vessel of his fleet and sent it to Fort Pickens, he found himself unable to render aid. On his return North, Fox was appointed Assistant Secretary of the Navy, a position which he held throughout the war. To him is to be credited the plan for opening up the Mississippi, for the capture of New Orleans, and the selection of Farragut for high command. In 1866 he was sent to Russia on a special congratulatory mission to the Czar, Alexander II., who had just escaped assassination. While in Saint Petersburg he took part in the negotiations which resulted in the purchase of Alaska. Upon his return to America he again entered the wool-manufacturing business at Lowell, from which he had retired on the outbreak of the war. Consult Loubet, *Narrative of Fox's Mission to Russia in 1866* (New York, 1873).

FOX, HENRY, Baron HOLLAND (1705-74). See HOLLAND, HENRY FOX.

FOX, HENRY EDWARD (1755-1811). An English soldier, the younger brother of Charles James Fox. After a brief education at Westminster School, he entered the King's Dragoons in 1770. Three years later he was made lieutenant of the Thirty-eighth, quartered in Boston. He served at Concord, Bunker Hill, Long Island, White Plains, Brandywine, and Philadelphia, and in 1777 was made major and a year later lieutenant-colonel of the Forty-ninth Regiment, and with it saw service in the West Indies. In 1783 he returned to England, and was made aide-de-camp by the King, who took a great fancy to him. Major-general in 1793, he commanded a brigade at Roubaix and Mouveaux, and at Pont-à-Chin (1794) beat back a French army. In 1801 he was sent to Minorca, and stayed there until 1803, when he went to Ireland as commander-in-chief, and was badly frightened by the feeble rebellion under Emmet. In the next year he was made Lieutenant-Governor and actual commander of Gibraltar, and in 1806, on the accession of the

Ministry of All the Talents, was appointed Ambassador to Naples and commander of the forces in Sicily; but he accomplished little there, because of the quarrel with the Neapolitan Court which grew out of his unwillingness to risk all in an attempt to drive the French out immediately. In 1807 he was recalled by the new Ministry, after his brother's death, and subsequently was made general (1808) and Governor of Portsmouth (1811). He married Marianne Clayton (1786), and had two daughters and one son, Henry Stephen (1791-1846), who was Minister to the United States (1835), and did much to promote the success of the Ashburton Treaty.

FOX, JOHN (1863-). An American novelist, noteworthy for vivid description of life in Kentucky, his native State, of whose mountain dialect he is master. He was born in Bourbon County, Ky., in 1863, and was graduated from Harvard in 1883. After some experience in journalism, he traveled in Southern States and California, and afterwards engaged in business at Cumberland Gap, where he had ample opportunity for the study of mountain life. He wrote: *A Mountain Europa; A Cumberland Vendetta* (1895); *The Kentuckians*; *Crittenden* (1900), a novel of the Cuban War; and *The Little Shepherd of Kingdom Come*; also two volumes of short stories—*Hell fer Sartain, and Other Stories* (1897), and *Blue Grass and Rhododendron* (1901).

FOX, LUKE (1586-1635). An English navigator. He was born at Hull, and went to sea at an early age. On April 30, 1631, he sailed from London to search for a northwest passage. The results of his explorations were subsequently embodied in the work entitled *Northwest Fox*; or, *Fox from the Northwest Passage* (1635), a work which contained a most interesting map of the Arctic regions as then known. He made an extensive exploration of the western shore of the land now named after his predecessor, Baffin, and discovered Cumberland Island and other points along Hudson Strait. The far northern channel through which he passed has been named after him.

FOX, MARGARET (1836-93). An American spiritualist, born at Bath, Canada. At Hydeville, Wayne County, N. Y., about 1848, there were heard in the Fox residence rapping noises which appeared to proceed from the walls and furniture. Margaret and her two sisters, Catharine and Leah, discovered that by means of a given code communication could be established with the presumably supernatural agency by which the raps were produced. The sisters gave public sances in America and Europe, the chief features of which were the spirit rappings and the moving of large bodies by invisible means. So-called 'mediums' became numerous, and the investigation of spiritualistic phenomena interested many. From the first, however, scientific minds discredited the claims of the sisters. In 1888 Margaret made a confession of imposture, later retracted. See SPIRITUALISM.

FOX, RICHARD. See FOXE.

FOX, WILLIAM JOHNSON (1786-1864). An English Unitarian preacher, orator, and political writer. The son of a peasant farmer, he was born at Uggeshall Farm, Wrentham, Suffolk, March 1, 1786. His father removed to Norwich, where he pursued various callings, and Fox, after

primary education at a chapel school, and working as an errand boy and weaver's help, became a banker's clerk. He devoted his leisure to self-improvement in arts and languages, and presently was sent to Homerton Independent College for ministerial training. He subsequently seceded to Unitarianism, and in a London charge became celebrated as a rhetorician and the most eloquent exponent of English rationalism. An unfortunate marriage and separation led to his resignation from the ministry, and he devoted himself to literature and public speaking. In the interests of free trade and the Anti-Corn Law League he thrilled enthusiastic popular audiences with his oratory. From 1847 to 1863 he represented Oldham in Parliament, as an advanced Liberal. His speeches in that critical assembly did not equal the success of his platform orations; but he soon acquired general respect by his tact and discretion. His best Parliamentary addresses were in favor of public education and the extension of the franchise. He was the first contributor to *The Westminster Review*, he was editor of *The Monthly Repository* for many years, and he contributed copiously to other organs of public opinion. His *Lectures of a Norwich Weaver Boy* and *Lectures to the Working Classes* had an extensive and popular circulation, and did much to effect the reforms they advocated. *Religious Ideas* is his most important theological work. His voluminous writings, sermons, and orations are collected in the memorial edition of his works (London, 1865-68). He died June 3, 1864.

FOX-BAT. Any large fruit-eating bat, or 'flying fox,' of the family Pteropodidae, esteemed the lowest in rank of the Chiroptera. There are some seventy species, inhabiting Africa, India, China, Japan, and the Malay Archipelago, where they especially abound. Most are of large size, are tailless, have small, pointed ears, large eyes, noses free of lobes, and those of the type-genus much resemble in physiognomy, size, and color the foxes after which they are named. A Javan species spreads its wings five feet, and is eaten by the natives. These bats are wholly frugivorous, nocturnal, gregarious, and do great damage where numerous, especially to cocoanut and mango plantations. A strong musky odor pervades, at night, the vicinity of their assemblies, and one credible writer asserts that the flying foxes are fond of drinking palm toddy from the chatties left out overnight. An African genus of this family supplies the common Egyptian bat, which flocks in the chambers of the pyramids and other tombs, and is figured on the monuments; it is *Xantharhia Egyptiaca*. An Austro-Malayan genus is termed Harpia, in reference to the supposition that a bat of this sort is the basis for the harpies of classic mythology. Consult Wallace, *Malay Archipelago* (New York, 1869). See FRUIT-BAT.

FOX CHANNEL. A northern reach of Hudson Bay, Canada, inclosed on the west by Southampton Island and Melville Peninsula, and on the east by Fox Land and Baffin Land (Map: Canada, P 3). It has a southeast outlet through Hudson Strait, and a northwest outlet through Fury and Hecla Strait. It was named after Luke Fox, who explored Hudson Bay in 1631.

FOX DEITY AND FOX-POSSESSIONS. In Chinese Asia, popular belief ascribes to the fox

extraordinary powers, and the ability to assume human or any shape, but generally that of beautiful women, and to work all kinds of mischief, especially in love affairs. Possession by the spirit of a fox is so thoroughly believed in that a standard source of revenue for Buddhist priests of certain sects is in practicing exorcism from their suffering patients, usually women. The foxes in their various transformations appear to the good or evil with rewards or punishments in quite the orthodox story-book style. In Japan the fox is the attendant on the food god, Inari (Rice-bearer, or Rice-man), and myriads of effigies of the creature in white or colored material, usually stone, may be seen near the Inari shrines. Giles tells us that "in some parts of China it is customary for mandarins to keep their seals of office in what is called a 'fox chamber'; but the character for fox is never written, the sight of it being supposed to be very irritating to the live animal. A character which has the same sound is substituted, and even that is divided into its component parts, so as to avoid the slightest risk of offense. This device is often adopted for the inscriptions on shrines erected in honor of the fox." Consult: Pfoundes, *Fu-So Mimi Bukoro* (Yokohama, 1875); Mitford, *Tales of Old Japan* (London, 1876); Chamberlain, *Things Japanese* (London, 1892); Griffiths, *The Mikado's Empire* (New York, 1900).

FOX-DOG. A book name for a group of small South American canine animals, on account of their somewhat fox-like aspect. The group was defined by Mivart, *Proceedings of the Zoological Society of London* (London, 1890), as including five species, as follows:

Crab-eating fox-dog (*Canis cancrivorus*), Brazil.

Short-eared fox-dog (*Canis microtis*), Brazil.

Azara's fox-dog (*Canis Azaræ*), Brazil to Tierra del Fuego.

Small-toothed fox-dog (*Canis parvidens*).

Black-tailed fox-dog (*Canis urostrictus*), Brazil.

These animals are much alike in their foxy appearance, though rather larger in size, and having a more variegated and highly variable coat, often handsomely marked with black and dark red, than any true fox. The crab-eating fox-dog is common throughout the forested parts of the whole Amazon basin, and gets its name from its fondness for crayfish, though these crustaceans form only a part of its fare. They often collect in packs and run down deer. Azara's dog (see Plate of WOLVES AND WILD DOGS) is known throughout the whole continent east of the Andes, on the pampas and bleak shores of Patagonia (where it is called colpeo), as well as in the forests of Brazil and Guiana. It has much the habits of the North American coyote, but resorts to jungles and forests much more readily. Everywhere it is fox-like in its fondness for poultry, and in Paraguay it is said to destroy a great amount of sugar-cane while eating only a little. The small-toothed species takes its name from the diminutive size of the fourth premolar, and of the short-eared dog almost nothing is known. Consult Hudson, *The Naturalist on the La Plata* (London, 1892).

FOXGLOVE. The very inappropriate name of a genus (*Digitalis*) of about 18 species of beautiful half-hardy herbaceous biennial plants of the order Scrophulariaceæ. The erect stems,

which bear numerous large leaves at their bases, terminate in long racemes of inflated campanulate flowers, of various colors and markings. Individually foxgloves are attractive, and



FOXGLOVE.
(*Digitalis Purpurea*.)

in masses they give character to the flower border. They succeed well in light, rich soil, not too dry in either exposed light or in partial shade. When once established, they will reproduce sufficient plants from seed to keep the border stocked. One species, credited with diuretic, sedative, and narcotic properties, is officially listed in dispensaries under the name *Digitalis* (q.v.).

FOXGLOVE, JOHN (1516-87). The English martyr-ologist. He was born in 1516, at Boston, Lincolnshire. In 1523 he entered as a student at Oxford; in 1537 he took his bachelor's, and in 1543 his master's degree, and was elected a full fellow of Magdalen College (1539). He displayed at an early period an inclination for Latin poetry, and wrote several plays in that language upon scriptural subjects. Of these, the only one that remains, entitled *De Christo Triumphante*, was first printed at Basel in 1556. The religious movements of the times led him to study the great controversy between the Old Church and Protestantism, and becoming a convert to the principles of the Reformation, on July 22, 1545, he resigned his fellowship. In 1546 he married, and coming to London for employment, he attracted the notice of the Duchess of Richmond, and through her influence became tutor (1548) to the children of her brother, the Earl of Surrey, then a State prisoner in the Tower. On June 23, 1550, he was ordained deacon by Ridley, Bishop of London, and preached the doctrines of the

Reformation at Reigate. In 1553, when Mary came to the throne, he was dismissed by the Catholic grandfather of his pupils, and fearing persecution for his religious opinions, he fled to the Continent. On the accession of Elizabeth, he returned to England in October, 1559; was ordained priest 1560, and in May, 1563, he was made a prebendary in Salisbury Cathedral and Vicar of Shipton. He also held the living of Cripplegate, which he soon resigned, and for a year (1572-73) he held a stall at Durham. In 1575, when some Dutch Anabaptists were condemned to the flames in London, Foxe interceded for them with Elizabeth and other persons in authority, but without effect. He wrote numerous controversial and other works, but the one that has immortalized his name is his *History of the Acts and Monuments of the Church*, popularly known as *Foxe's Book of Martyrs*, the first draft of which was published at Strassburg in 1554. The first English edition appeared in 1563. Sanctioned by the bishops, it was ordered, by a canon of the Anglican convocation, to be placed in every cathedral church in England, and has gone through innumerable editions. It is not a critical work, as might be supposed, and Roman Catholics deny its trustworthiness. The best editions are by Cattle, with introduction by Townsend (London, 1843-49); Mendham and Pratt (8 vols., ib., 1853); and by Stoughton (London, 1877). Foxe died in London, April, 1587, and was buried in the chancel of Saint Giles's, Cripplegate, London. There is no satisfactory life of Foxe; the first issued (1641) was very unreliable; the nearest approach to correctness is that revised by Pratt (London, 1870).

FOXES, or FOX, RICHARD (c.1448-1528). An English prelate and statesman, born at Ropesley and educated at Oxford. He left Oxford because of the plague, and studied for a short time at Cambridge, and then went to Paris. There he made the acquaintance of Henry of Richmond, and helped him get money and men from the French King for his invasion of England. After the accession of Henry VII., Foxe was one of the King's most trusted advisers, and became Secretary of State, Privy Seal, and Bishop of Exeter. He was sent to Scotland as Ambassador several times, negotiated a treaty between England and Scotland in 1487, and again in 1497, after a stout defense of his castle in Durham. In the interval he had been a signer of the Treaty of Etaples (1492), and commissioner on the *Intercursus Magnus*, a treaty with Philip of Austria (1496). In 1498 and 1499 he treated with the Scotch King, and made arrangements for his marriage with the Princess Margaret. In the following year he was chosen Chancellor of Cambridge, and was Master of Pembroke (1507-19). Under Henry VIII. his political influence gradually diminished. He retired from the Court in 1516, and became blind a few years after. But his last years were spent well; he founded free schools at Taunton and Grantham, and at Oxford. Corpus Christi College (1516). The story that Wolsey urged him to resign his bishopric to him, and that Foxe refused, has little authority. Foxe may have had a share in the writing of *Contemplacyon of Synners* (1499). He edited a *Processional* (1508); and translated the *Rule of Saint Benedict* (1517).

FOXHOUND. A small hound, trained to the pursuit of the fox. See HOUND; FOX-HUNTING.

FOX-HUNTING. There are various fashions of hunting the fox. In England, the home of fox-hunting, he is pursued by carefully bred packs of hounds ranging in number from twenty-five to forty couples, who are put by the huntsmen into a covert or wood, where it is known, or thought, the fox has his earth. He would elude the hounds almost invariably were it not for the scent left in the air along his track. One or another hound is sure to come across the scent, and give tongue, so that the remainder of the pack quickly follow. They break cover, and are joined outside by the horsemen who follow the chase. The fox will, as a rule, go down wind, and make straight for some spot where he can baffle the hounds by getting under cover, or into an earth where they cannot follow him. Sometimes he throws the dogs off his scent by a subterfuge, and again he arrives at his earth only to find that it has been filled up by the 'stopper,' and he has to make off on another venture. Sometimes he is killed in the open. The kenneling and maintenance of hounds and huntsmen and the establishments kept up in the most favored neighborhoods necessitate an immense expenditure annually. The most important hunts in England are the Belvoir Castle, the Quorn, the Pytchley, and the Cottesmores. Leicestershire also is a favorite hunting county, but the sport is practically general throughout England, and in a lesser degree in Ireland. In America, the Virginian colonists early followed the English method of fox-hunting, with the difference only that the pack was made up by each gentleman bringing his own hounds with him. The sport was common in the Southern States up to the time of the Civil War, and there are still sections where it is conducted much as in the old days. In Maryland the English foxhound was crossed with the Irish stag-hound to give him the necessary endurance for more difficult conditions; and the records of fox-hunting in Queen Anne County go back to 1650. Dissatisfied with the gray native fox, the colonists in 1738 imported red foxes, and let them loose along the shores of the Chesapeake. They multiplied rapidly, and the Baltimore Hounds, established in 1818, have always been among the most famous in the South. The English pack has been discarded, and the Magnes strain, a distinctly Maryland dog, adopted by the Elkridge Club, the most prominent in Maryland. Pennsylvania had the first organization, the Gloucester Fox-Hunting Club, established in 1766. The American hound is faster and better than the English dog, and peculiarly well adapted for his work. In America, a 'kill' is an exception with the average hunt. 'Earths,' as the holes in the ground are called, are never 'stopped' or closed as in an English fox-hunting country, and it is very rarely that an attempt is made to dig out a fox who has taken refuge in one. Particularly is this true where the fox has made a straight, true race. Occasionally it happens that a fox becomes known, and is given a name, owing to the frequent sport he has afforded the hunt, and his exceptional skill in always making his escape. Where foxes are not found, or it is desirable to spare the cubs, drag-hunting is a very fa-

vorite sport as well as an excellent training for young horses, dogs, or riders. A course from point to point is mapped out, and a good rider, well mounted, is sent over it dragging on the ground as he goes a bag of aniseed, or a red herring. The hounds are cast off, and pick up the scent with as much avidity and certainty as if it were that of a fox. The riders follow the hounds on horseback, and if the pace of the hounds is good, and the course suitable, a very effective and exhilarating ride is the result. The chronicles of drag-hunting go back to the reign of Charles II., further back in fact than the existence of any of the great foxhound packs today, and its practice has continued ever since. (See HORSE; HORSEMANSHIP; HUNTING.) Consult Paget, *Hunting* (London, 1900).

FOX-HUNTING, in law. As one of the national sports of Great Britain, fox-hunting is the subject not only of social usages, but of legal rules. Persons who kill foxes by traps or guns are visited with social ostracism; while those who hunt them with horses and hounds are exempted by statute from penalties for trespass within lands of others in certain cases. A master of hounds, as well as one who follows hounds in fox-hunting, is generally answerable civilly, however, for damage done to the property of others. A fox is not the subject of absolute ownership until killed or reduced into possession, and therefore not the subject of larceny. A person may acquire a qualified property, however, in tame foxes, and for injuries done by such animals he should be held liable, as for those inflicted by other *fera nature* (q.v.).

Until recently the legal status of the fox in this country has been that of a noxious wild animal, liable to killing at sight by trap, gun, or dog. With the introduction of fox-breeding and fox-hunting upon large private estates has come a change in legal policy, and statutes have been enacted prohibiting the killing of foxes during certain months. Laws against cruelty to animals have been invoked to prevent the hunting of captive foxes by dogs. Consult: *Commonwealth vs. Turner* (145 Mass. 296, 1887); *New York Session Laws* (1901, ch. 559); *Oke, Handy Book of the Game Laws* (4th ed., London, 1897).

FOX ISLANDS. Another name for the Aleutian Islands (q.v.).

FOX RIVER. A river of Wisconsin, rising in the southern part of the State, in Green Lake County (Map: Wisconsin, E 4). It flows first in a southwesterly direction to within a few miles of the town of Portage, on the Wisconsin River, with which it is connected by a ship canal. At this point the Fox turns abruptly to the northeast, and pursues a circuitous course through the State to Lake Winnebago, through which it passes, connecting that body of water with Green Bay, an arm of Lake Michigan. It is sometimes known by the Indian name of Neenah. It is navigable for a considerable part of its course, and, through the medium of the canal connecting it with the Wisconsin, forms a link between the navigation systems of the Mississippi and the Great Lakes. The lower part of the Fox is marked by numerous rapids, furnishing great water-power. Its total length is over 250 miles.

FOX-SHARK. See THRESH-SHARK.

FOX-SNAKE (so called from its color). An American harmless snake (*Coluber vulpinus*) inhabiting only the northern part of the Mississippi Valley. It reaches six feet or more in length, is robust, and although harmless, is easily irritated and then shows more pugnacity and courage than almost any other of its tribe. It feeds altogether upon small mammals, up to the size of a half-grown rabbit, and does farmers much service by killing great numbers of mice. Its color above is light brown, blotched on the back with chocolate, each blotch covering a space three or four scales long and bordered with black. Smaller and rounder blotches mark the sides and yellowish abdomen. It is locally known, also, as the pilot-snake, very likely by vague confusion with the copperhead. Consult Hay, *Seventeenth Annual Report, State Geologist of Indiana* (Indianapolis, 1892).

FOX-SPARROW (so called on account of its color). One of the largest and handsomest of North American sparrows (*Passerella iliaca*), distinguished by the rust-red of its plumage; purest and brightest on the rump, tail, and wings, and elsewhere on the upper parts appearing as streaks on an ashy ground; below it is white thickly marked with rust-red. It is a migrant, passing to northern Canada to breed, and favoring us on its passage in early spring with a loud and sprightly song, more like that of a thrush than a sparrow. It makes its nest on the ground, in the protection of thickets, and lays thickly spotted eggs.

FOX-SQUIRREL (so called on account of its color). The large rufous squirrel of the Mississippi Valley. See SQUIRREL.

FOXTAIL GRASS. A name applied to two very dissimilar grasses of the genera *Alopecurus* and *Chaetochloa*, or *Setaria*, as it is better known. They bear a general resemblance to timothy, with which they are closely related. The species, which number about twenty, are natives of temperate countries of both the Northern and Southern Hemispheres, and several are American. Meadow foxtail grass (*Alopecurus pratensis*), which has an erect smooth culm about one and one-half to two and one-half feet high, and a cylindrical, obtuse, spike-like panicle abundantly covered with silvery hairs, is one of the best meadow and pasture grasses in Europe, and introduced into America. It does not arrive at full perfection till the third year after it is sown. It bears mowing well, and upon good soils yields a large crop, and is reckoned a good grass for lawns. It is very hardy, and bears drought well. The jointed foxtail, or water-foxtail (*Alopecurus geniculatus*), with an ascending culm bent at the joints, is very common in moist places, and cattle are fond of it, but it is a small grass growing but a foot or two high. The slender foxtail grass (*Alopecurus agrestis*) is an annual or biennial, of little value except for light sandy soils, on which it is sometimes sown. *Alopecurus occidentalis* is a native of the United States, and would doubtless prove valuable in the Rocky Mountain region and elsewhere. These grasses are all valuable, but should be sown in mixtures.

The other class of foxtail grass belongs to the genus *Setaria*. Other generic names have been given them, but these will suffice. They are

mostly considered as weeds and are more or less troublesome, although when young they are eaten by stock, and the seeds of some are gathered. There are about thirty-five species, some of them exceedingly valuable. They are distributed throughout all warmer and temperate regions. The Hungarian grass or millet (*Setaria italica*), with its varieties, is extensively cultivated for its forage and seed. The latter is employed as human food in some countries, as in India, Russia, etc. The giant millet (*Setaria magna*) grows in wet places from Delaware to Florida. The common species of yellow foxtail (*Setaria glauca*), green foxtail (*Setaria viridis*), and bristly foxtail (*Setaria verticillata*), are weeds that are more or less abundant in fields and gardens of nearly all temperate countries. *Hordeum murinum* is called foxtail grass in California and elsewhere.

FOX-TERRIER. A terrier, usually white with black or tan markings, originally used for unearthing foxes, but now principally as a pet. See **TERRIER**.

FOY, fwä, MAXIMILIEN SÉBASTIEN (1775-1825). A distinguished French general and orator. He was born at Ham, in the Department of Somme, February 3, 1775. He was one of the volunteers of 1791, and during the next nine years served with distinction under Dumouriez, Moreau, Schoenbourg, and Masséna. In 1800 he was made adjutant-general in the Army of the Rhine, which marched through Switzerland into Italy, where he commanded the vanguard of the army in 1801. In 1805 he served under Marmont in the Austrian campaign. Two years later Napoleon sent him to Turkey at the head of 1200 artillerymen to assist Sultan Selim against the Russians and British. Under the direction of the French Ambassador, General Sébastiani, Foy defended Constantinople and the Strait of the Dardanelles, forcing Duckworth, the daring British admiral, to retire with loss. After 1808 he fought in the Peninsula, at first under Junot, and then as general of division under Soult and Masséna. He distinguished himself in the retreat into France, and was severely wounded at Orthez. In the campaign of 1815 he commanded a division on the field of Waterloo, where he was wounded for the fifteenth time. In 1819 he was elected Deputy by the Department of Aisne. In the Chamber he was the constant advocate of constitutional liberty, and showed great rhetorical talent and knowledge of political economy. He distinguished himself particularly by his eloquence in opposing the invasion of Spain in 1823. Mme. Foy published in 1827, from her husband's papers, *Histoire de la guerre de la péninsule*. In the previous year appeared his *Discours* with a biography.

FOYATIER, fwä'yä'tyÄ', DENIS (1793-1863). A French sculptor, born at Bussière (La Grande), Loire. First instructed by Marin at Lyons, he studied afterwards under Lemot, and from 1817 at the Ecole des Beaux-Arts in Paris. For the statue of a "Faun" he was awarded the gold medal in 1819, and thenceforward executed numerous commissions for public buildings and churches in Paris and other cities. His more noteworthy works include a statue of "Saint Mark," in the Cathedral at Arras; "Wisdom" (1831), in the Chamber of Deputies, Paris; "Astydamas and Lucilia" (1833); "Faith," in Notre Dame de Lorette,

Paris; "Figures of Apostles," in the Madeleine, Paris; the great "Frieze in Relief," on the Arc de l'Etoile, Paris, one of his most admired productions; and the "Equestrian Statue of Jeanne d'Arc" (1855), at Orleans.

FOYER, fwä'yä' (Fr., hearth). The lobby of a theatre, or large saloon in a theatre, in which the *personnel* of the theatre or the audience may promenade between the acts. It is almost always over the entrance hall. In some of the most recently erected French theatres there are two foyers, one over the other, for the accommodation of the different classes who occupy the dress circle and the upper galleries. The most magnificently decorated foyer in the world is that of the Grand Opera House in Paris.

FOYLE, foil, LOUGH. An inlet of the Atlantic, on the north coast of Ireland, between the counties of Londonderry and Donegal. It is 16 miles long, one mile wide at its entrance, and nine miles wide along its south side (Map: Ireland, D 1). A great part of it is dry at low water. The west side alone is navigable for vessels of 600 tons, which ascend its chief tributary, the Foyle, to Londonderry. The River Foyle, formed by the confluence of the Mourne and Finn at Lifford, flows 14 miles northeast to the lough. It has salmon fisheries.

FRAAS, fräs, KARL NIKOLAUS (1810-75). A German writer on agriculture. He was born at Rattelsdorf, Upper Franconia, and was educated at Munich. He was for several years professor of botany at the University of Athens, where he was also director for a time of the Royal Gardens and of the Royal School of Arboriculture. He was professor of agriculture at the University of Munich from 1847 to 1853, when he became director of the Institute of Veterinary Surgery in that city, which he thoroughly reorganized. He was chief secretary of the Bavarian Agricultural Society, and in association with Liebig conducted the agricultural experiment station organized by that society. Probably no other man of his time did so much to modernize agricultural methods in Bavaria, and his efforts in behalf of fish hatcheries were scarcely less noteworthy. His works include: *Die Schule des Landbaues* (5th ed. 1871); *Die künstliche Fischerzeugung* (2d ed. 1854); *Geschichte der Landbau- und Fortswissenschaft seit dem 16ten Jahrhundert* (1866); *Das Wurzelleben der Naturpflanzen* (2d ed. 1872).

FRAAS, OSKAR (1824-97). A German geologist, born at Lorch. After holding pastorates in various parts of Germany he was successively appointed custodian of the Royal Cabinet of Natural History at Stuttgart (1854), and professor of geology (1856). Already as a student he had received a prize for a geognostic chart of Tübingen, and in 1859 he was engaged with Deffner in preparing a similar chart of Württemberg. In 1866 he made important archaeological discoveries at Schussenried, Württemberg, and in 1875, on behalf of Rustem Pasha, he made the first geological survey of the Lebanon, described by him in the publications entitled *Drei Monate am Libanon* (2d ed. 1876), and *Geologische Beobachtungen am Libanon* (1878). Among his other works are: *Vor der Sündflut: Eine populäre Geschichte der Urwelt* (3d ed. 1870); *Geognostische*

Beschreibung von Württemberg, Baden und Hohenzollern (1882).

FRACASSE, frä'käs'. See CAPITAINE FRACASSE.

FRACASTORO, frä'käs-tō'rō, GIBOLAMO (1483-1553). An Italian poet and physician, born of an ancient family at Verona. At the age of nineteen he was appointed professor of logic in the University of Padua. On account of his eminence in the practice of medicine, he was elected physician of the Council of Trent. His Latin verse also exhibits remarkable elegance. A bronze statue was erected in his honor by the citizens of Padua, while his native city commemorated their great compatriot by a marble statue. His writings in prose and verse are numerous. The chief among them are: *Syphilis, sive Morbi Gallici* (1530); *De Vini Temperatura* (1534); *Homocentricorum sive de Stellis, de Causis Criticorum Dierum Libellus* (1535); *De Sympathia et Antipathia Rerum, De Contagionibus et Contagiosis Morbis, et eorum Curatione* (1546). The collected works of Fracastoro appeared for the first time in 1555.

FRACTION (Fr., OF. *fraction*, Lat. *fractio*, from *frangere*, to break; connected with Goth. *brikan*, OHG. *brehhan*, Ger. *brechen*, AS. *brecan*, Eng. *break*, and possibly with Gk. *ῥήγναι*, *rhēgnynai*, to break, OIr. *conboing*, breaks). A fraction is commonly defined in arithmetic as one or more of the equal parts of a unit or quantity. This definition, however, is not sufficient for expressions like $\frac{2}{-3}$, $\sqrt{\frac{3}{2}}$ since "2 of the — 3 equal parts of unity," or "one $\sqrt{2}$ th of 3," is meaningless. Hence, in general, the symbol $\frac{a}{b}$, in which b is not zero, is regarded as denoting the division a by b .

A fraction is said to be irreducible, or to be in its lowest terms, when the greatest common divisor of its terms has been suppressed. In arithmetic, a fraction whose numerator is less than its denominator is called a proper fraction. In algebra a proper fraction is one whose numerator is of less degree than its denominator. In the contrary cases the fractions are called improper. Numerical fractions of the older form, as $\frac{3}{4}$, are called common or vulgar fractions as opposed to the more recent form of 0.75, called decimal fractions. (See DECIMAL SYSTEM.) The term was originally applied to this form as opposed to the 'astronomical' or 'physical' fractions, i.e. those on the sexagesimal system. The operations with algebraic fractions are subjected to the associative, commutative, and distributive laws (q.v.); e.g.

$$\frac{a}{b} + \left(\frac{c}{d} - \frac{e}{f}\right) = \left(\frac{a}{b} + \frac{c}{d}\right) - \frac{e}{f};$$

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{c}{d} \cdot \frac{a}{b};$$

etc. Fractions of the form $\frac{a}{\frac{b}{c}}$ are called com-

plex fractions, and obey the same laws as simple fractions; e.g. the complex fraction just mentioned equals

$\frac{a}{b} + \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} = \frac{ad}{bc}$
Complex fractions of the form

$$\frac{\frac{a}{b}}{\frac{c}{d} + \frac{e}{f}} + \dots$$

are called continued fractions. Such fractions are usually simplified to the best advantage by first multiplying the terms of the last fraction of the form

$$\frac{\frac{c}{d}}{\frac{e}{f}}$$

by the last denominator, and so working up. The theory of continued fractions, however, is extensive, and their properties are numerous. In the above fraction,

$$\frac{a}{b}, \frac{ad}{bd+c}, \frac{a(fd+e)}{b(fd+e)+fc}, \dots$$

are the simplified forms of the fraction inclusive of the first, second, and third denominator successively, and so on. These are fractions evidently converging toward the true value of the given fraction. It is proved in algebra that the difference between any two consecutive convergents is equal to 1 divided by the product of their denominators; that the value of the fraction lies between each successive pair of convergents, and hence differs from either by less than their difference; e.g.

$$\frac{6985}{2151} = 3 + \frac{482}{2151} = 3 + \frac{1}{\frac{2151}{482}}$$

$$3 + \frac{1}{4 + \frac{1}{2 + \frac{1}{6 + \frac{1}{5 + \frac{1}{7}}}}}$$

or as it may be written,

$$\frac{3}{1} + \frac{1}{4} + \frac{1}{2} + \frac{1}{6} + \frac{1}{5} + \frac{1}{7}.$$

Here the convergents are

$$3, \frac{13}{4}, \frac{29}{9}, \frac{187}{58}, \frac{964}{299}, \frac{6985}{2151}.$$

The difference between the last two convergents is $\frac{1}{299 \cdot 2151} = 0.0000016$, hence the next to the last convergent, expressed decimally, gives the value of the original fraction correct to 5 decimal places.

A fraction whose numerator is an integer and whose denominator is an integral power of 10 is called a *decimal fraction*; e.g.

$$\frac{1}{10}, \frac{1}{100}, \frac{3505}{10000}$$

are decimal fractions, although given in the form of common fractions. Such fractions admit of an abbreviated notation; e.g. 0.1, 0.01, .3505, which possesses great advantages in calculation. See also CIRCULATING DECIMALS.

In some algebraic fractions the substitution of a particular value of the letters will make both numerator and denominator vanish. Such frac-

tions are called *vanishing* fractions; e.g. the fraction $\frac{x^2-1}{x-1}$ becomes $\frac{0}{0}$ when $x = 1$. The value of a fraction which assumes the form $\frac{0}{0}$ for particular values of the letters involved is, in general, found by means of the differential calculus. But frequently that value may be found by simpler means, as in the above example

$$\frac{x^2-1}{x-1} = \frac{x-1}{x-1} \cdot (x+1) = x+1,$$

the limit of which, for $x = 1$, is $1+1 = 2$. (See LIMITS.)

Doubtless the notion of a fraction is nearly as old as the notion of number. Among the oldest treatises on fractions is the arithmetic of Ahmes (q.v.), showing how the Egyptians dealt with fractions before the year 2000 B.C. They made extensive use of unit fractions, i.e. fractions with the numerator 1. In the hieratic writing, the denominator with a point above it was the symbol for such a fraction. The first problem Ahmes solves is that of separating a fraction into unit fractions; e.g. he finds

$$\frac{2}{9} = \frac{1}{6} + \frac{1}{18}, \quad \frac{2}{95} = \frac{1}{60} + \frac{1}{380} + \frac{1}{570}.$$

The fractions of the Babylonians were sexagesimal, having at the outset a common denominator 60, and could be dealt with like whole numbers. In the written form only the numerator was given, with a special fractional sign attached. The Greeks wrote the numerator below or else before the denominator thus:

$$\frac{\kappa\alpha}{\iota\zeta}, \text{ or } \frac{\kappa\alpha'}{\iota\zeta}, \text{ or } \iota\zeta' \frac{\kappa\alpha''}{\kappa\alpha''} = \frac{17}{21}$$

The Romans made much use of the duodecimal system, and gave special names to their fractions which corresponded to

$$\frac{1}{12}, \frac{2}{12}, \dots, \frac{11}{12}.$$

To the Hindus is due the present form of the common fraction. Although the sexagesimal and duodecimal fractions prepared the way for decimal fractions, the latter did not appear in their present form until early in the seventeenth century. Among the first to use such fractions were Rudolf, Bürgi, and Stevin. The first general use of the decimal point is found in the trigonometric tables of Pitiscus (1612).

FRACTURE (Lat. *fractura*, a break, from *frangere*, to break). In surgery, the term is used of the break of a bone or of partially ossified cartilage. A fracture is said to be *simple* where the break is not open to the air; *compound* when it is so open; *single* when there is but one break; *multiple* when more than one break exists; *comminuted* when the bone is broken into many little pieces; *impacted* when one fragment of the bone is driven into the other; *complicated* when a neighboring joint or large blood-vessel is involved in the traumatism; *complete* when the whole thickness of the bone is ruptured; *incomplete* (or green-stick) when the bone is partly broken, partly bent; *intra-capsular* when the break occurs within the capsule of a joint; and *transverse*, *oblique*, *longitudinal*, or *spiral*, according to the direction and position of the break as regards the shaft of the bone.

Among the external causes of fracture are accident or violence, and excessive muscular action. The condition known as *fragilitas ossium* occurs late in life, or in early life, as a softening of the bone from disease. Cancer, syphilis, scurvy, and rickets often result in altered bone-structure. Muscular action causes rupture of *patella* or *os calcis* (heel-bone), during the endeavor to prevent falling after tripping, or in running or jumping. The symptoms are: pain over the region; swelling and great local tenderness; change in position or shape of the part; false point of motion; crepitation (crackling, as the broken ends of the bone are rubbed together); and immobility on the part of the patient, together with increased motion secured by the examining surgeon. In impacted fractures there are necessarily no crepitation, false point of motion, or mobility secured by the surgeon. Fractures must be reduced; that is, the fragments must be put into their proper position, and they must be retained by some apparatus. The splints used for retention are made of wood, tin, iron, felt, spongopiline, gutta-percha, leather, or of bandages saturated with plaster of Paris, with starch, or with soluble glass ('water glass,' silicate of soda solution). The limb is padded with cotton and the splint applied closely and rendered immovable. In the case of fractured ribs, a strip of adhesive plaster or a corset is applied. Rest must be secured; otherwise (or, in some cases, in spite of good attention) the fracture remains ununited; when rubbing the ends together, giving mercury internally to salivation, electricity or drilling holes in the ends, or wiring the ends together must be tried, to secure union. Compound fractures must be treated as described, and also as open wounds, under all antiseptic precautions. Drainage of pus and discharge must be secured, as well as protection against bacterial infection. See CALLUS.

FRA DIAVOLO, frä dë-ä'vô-lô (It., Brother Devil) (1770?-1806). A celebrated Italian brigand, born in Calabria, whose real name was Michele Pezza. He gathered a band of outlaws in the mountains of Calabria, in the country around Itri in Terra di Lavoro, and attacked alike strangers and villagers of the neighborhood. His atrocious cruelty and the fact that he had originally been a monk gained him the name of Fra Diavolo. Ferdinand of Naples summoned him to his aid against the French and made him colonel. In 1799, together with Cardinal Ruffo, he tried to stir up an insurrection in Calabria. In 1806 he repeated his attempt. He was seized by Masséna at San Severino, and was hanged at Naples as a bandit in spite of his regular colonel's commission. Auber's famous opera *Fra Diavolo*, libretto by Scribe, does not pretend to the least historical truth.

FRAGA, frä'gä. A town in the Province of Huesca, Spain, about 15 miles southwest of Lérida; on the River Cinca (Map: Spain, F 2). It is built on a slope and has ruined walls; among its buildings of note are the town hall, and the old parish Church of San Pedro, once a mosque. The town is in a fertile agricultural section, celebrated for its figs, which constitute the chief export. Stock-raising and some manufacturing also are carried on. Population, in 1900, 6934. Fraga, according to some authorities, is the *Gallica Flavia* of the Roman Empire. Of

considerable importance under the Moors and for a time a separate emirate, it was captured by the Christians in 1149, after having been previously taken, but retaken. Fraga was specially honored in 1709 by Philip V. for its loyalty in the War of the Spanish Succession.

FRAGIACOMO, frä'jā-kō'mō, PIETRO (1856—). An Italian marine painter. He was born at Trieste, and settled at Venice. A keen observer of nature and a fine colorist, he depicts with equal mastery the sea in many of its various aspects—barks and fishermen, the distant horizon, and the sky with its ever-varying light effects. Especially noteworthy among his paintings are: "Peace" (1891); "Mournfulness" (1892), in the National Gallery, Berlin; and "San Marco," in the Vienna Museum.

FRAGMENTA VATICANA (Lat., Vatican Fragments). A body of law documents in part preserved in a palimpsest, now in the Vatican library. They are thought to date from the time of Constantine.

FRAGONARD, frä'gō'när', ALEXANDRE EVARISTE (1780-1850). A French historical painter and sculptor, born at Grasse. He was the son of Jean Honoré Fragonard, and a pupil of David, whom he always imitated. His works consist of several decorative paintings for the ceilings of the Louvre, some historical pictures, and a bas-relief for the façade of the Chamber of Deputies, taken down to be replaced by a work of the modern sculptor Cortot. His "Triumphal Entry of Joan of Arc into Orleans" is in the Orleans Museum.

FRAGONARD, JEAN HONORÉ (1732-1806). A French genre painter, born at Grasse, in Provence. He studied under Chardin and Boucher, and his manner is distinctly that of the latter master. He won the Prix de Rome in 1752, and went to Italy, where he traveled considerably, and was influenced by the Venetian Tiepolo. Upon his return to Paris he exhibited "Callirhoë" (1765). He then executed various decorative paintings for Mme. du Barry, representing the "Loves of the Shepherds," at Louveciennes, and others for Guimard, the celebrated dancer. Afterwards he gave himself to genre subjects, some of which are suggestive of Greuze. He was also a landscape painter, an engraver, and worked in pastel and water-color. His coloring is charming, his drawing free and graceful, and, despite the often frank indelicacy of his subjects, he is more human than the classicists of David and his school. His works in the Louvre include: "Nymphs at the Bath"; "Bacchante Asleep"; "Music Lesson"; "The Guitar Player;" and "Cupid and a Girl." Other subjects are "The Happy Mother" and "The Cradle." In still another manner are "The Glass of Water," "The Tart," and "The Pot of Milk." His best known etching is "L'Armoire." His drawings include a set for the *Contes* of La Fontaine; these and others, sometimes original, sometimes after the Italian masters, are among his happiest inspirations. Consult: De Goncourt. *L'Art du XVIIIème siècle* (Paris, 1874); and Portalis, *Honoré Fragonard, sa vie et son œuvre* (Paris, 1883).

FRÄHN, frän, CHRISTIAN MARTIN JOACHIM (1782-1851). A German-Russian Orientalist and numismatist. He was born at Rostock, and was educated in that city and at Tübingen and Heidel-

berg. He was appointed professor of Oriental languages at the University of Kazan in 1807, and chief librarian at the Academy of Sciences, Saint Petersburg, in 1815. His principal works treat chiefly of the ethnology of the various races of Russia. They are based upon considerable research and include: *Nova Supplementa* (1855-77); *Ueber die Russen und Chazaren* (1819); *Ibn Fozzlans und anderer Araber Berichte über die Russen älterer Zeit* (1823); *Die ältesten arabischen Nachrichten über die Wolga-Bulgaren* (1832); *Ein neuer Beleg dass die Gründer des russischen Staats Nordmannen waren* (1838); *Rapports concernant des collections orientales de l'Académie Impériale* (1838).

FRAIKIN, frä'kän', CHARLES AUGUSTE (1819-93). A Belgian sculptor, born at Herenthals, Province of Antwerp. He studied at the Academy of Brussels. Among his works are: "Venus," "Captive Love" (1848); eleven statues for the Hôtel de Ville, Brussels; the statues of the counts Egmont and Hoorn, for the great square of that city; a Madonna, "Venus Anadyomene," "The Triumph of Bacchus," and the tomb of the Queen of the Belgians at Ostend.

FRAIL, Mrs. A licentious, shrewish widow, in Congreve's *Love for Love*. She is finally married to Tattle, taking him for Valentine, while he supposes her to be Angelica. She is the sister-in-law of Foresight.

FRAKNÓI, frö'knö-i, VILMOS (1843—). An Hungarian historian, born at Urmény. He was appointed to a professorship at Grau in 1865; was made librarian of the National Museum in 1875, and in 1879 secretary-general of the Academy, of which institution he became vice-president in 1889. His works, based upon exhaustive researches, and mostly written in the Hungarian language, include: *A Popular History of Hungary* (1873); *The Life of Archbishop John Vitéz* (1879); *The Conspiracy of Martinovitch* (1880).

FRAME (AS. *fremman*, *fremian*, Icel. *framja*, *frama*, OHG. *fremman*, *fremian*, to advance, further, from AS. *fram*, from, Icel. *framr*, Ger. *fromm*, earnest, pious; connected with AS. *from*, *fram*, Goth., Icel., OHG. *fram*, from, Gk. *πέραν*, *peran*, Skt. *para*, beyond). A name given to the box-like covering of any kind of hotbed, flued pit, or cold pit, to protect or forward plants at seasons of inclement weather. Frames are usually made of wood, and covered with glass or cloth. The popular form is 6 × 12 feet, and several inches higher at the rear than in front. The word 'cold' used to qualify 'frame' or 'pit' implies the absence of other heat than that from the sun. See HOTBED.

FRAMING. The jointing, putting together, or building up of the skeleton or frame of any structure. The term is used particularly in speaking of steel or wooden buildings and ships. See BUILDING; SHIPBUILDING.

FRAMINGHAM, frä'ming-hām. A town in Middlesex County, Mass., including the villages of Framingham Centre, South Framingham, Saxtonville, and Nobscot, 21 miles west of Boston, on the Boston and Albany and the New York, New Haven and Hartford railroads (Map: Massachusetts, E 3). It is the seat of a State Normal School, and has a public library, an historical and natural history society with a valuable collection, an almshouse, a hospital, and a

Home for the Aged. South Framingham is the principal business part of the town, and has manufactures of boots and shoes, chairs, rubber and straw goods; and Saxonville has extensive woolen cloth and yarn mills. The government is administered by town meetings. Framingham was settled about 1647, was known as Danforth's Plantation until 1700, when it was incorporated under its present name (from Framingham, England). Population, in 1890, 9239; in 1900, 11,302. Consult: Barry, *History of Framingham* (Boston, 1847); Temple, *History of Framingham* (Framingham, 1887).

FRA MOREALE, mō'rā-k'ā. See MONTREAL D'ALBANO.

FRANC, *Fr. pron.* frānk (Fr., derived from the device, *Francorum Rex*, King of the Franks, struck by King John II. on the coin in 1360). The unit of the monetary system of France and of the States of the Latin Monetary Union—Belgium, Switzerland, Italy, and Greece. At the present time the franc is in fact the twentieth part of the twenty-franc gold piece, or 2902 grams of pure gold, equivalent in United States money to 19.3 cents. When the present monetary notation was adopted in France, in 1795, supplanting the former livre tournois, the franc was a silver coin, nine-tenths fine, weighing five grams. Such coins ceased after 1865, when the franc coin was made a token, 835 fine, without change of weight. As a silver unit it still remained in its multiple the five-franc piece, nine-tenths fine, weighing 25 grams. In 1876 the coinage of the five-franc piece was discontinued. Silver coins of 5, 2, and 1 franc, and $\frac{1}{2}$ franc, are still in general use; but they are all, strictly speaking, tokens, gold having become the standard, and being represented in the coinage by pieces of 10 francs and 20 francs. The franc is theoretically divided into 100 centimes; but as the smallest coin in France is the five-centime piece, the old appellation of 20 sous to a franc (or livre) is still in frequent use. In Italy the franc is called lira, and in Greece drachma. In other countries not in treaty relations with France, the same unit prevails; in Finland, the marc; in Spain, the peseta; in Rumania, the lei; in Venezuela, the bolivar. See LATIN UNION.

FRANC, MARTIN LE (1410-61). A French poet, born in Normandy. He became secretary to the Duke of Savoy, afterwards Pope Felix V., and through him obtained various lucrative appointments, such as secretary to Nicholas V. Despite its accumulation of tedious detail, his long poem, *Le champion des dames* (1530), is now highly valued on account of its contemporary references and its vivid local color of the fifteenth century; and the same may be said of his prose work, *L'estrif de fortune et de vertu* (1519).

FRANÇAIS, frān'sā', FRANÇOIS LOUIS (1814-97). A French landscape painter, born at Plombières, Vosges. He did not enter the Ecole des Beaux-Arts until 1834. While there he studied under Corot and Jean Gigoux, and exhibited first in the Salon of 1837. Many of his lithographs are remarkable, and he was also an excellent engraver on wood; but it is as a landscape painter that he stands highest. Although many of his subjects are Italian, he is particularly the painter of the banks of the Seine and the country about Paris. Français belongs to no school; he is an idealist, from the essentially poetical qual-

ity of his brush, and a realist because of his perfect sanity and the restraint and decision of his work. "The End of Winter" (1853), "Orpheus" (1863), and "Daphnis and Chloë" (1872), his masterpiece, and "Evening," are in the Luxembourg. He received first-class medals in 1848, and at the Paris expositions of 1855 and 1867, and medals of honor at the Paris Exposition of 1878 and the Salon of 1890, and the cross of the Legion of Honor in 1867.

FRANCAVILLA, frān'kā-vē'lā. A city in South Italy, in the Province of Lecce, midway between Taranto and Brindisi (Map: Italy, K 10). It manufactures cloth, leather, and leather goods, and markets oil and wine. Population, in 1881, of commune, 16,000; in 1901, 20,422.

FRANCE. A republic of western Europe, lying between latitudes 42° 20' and 51° 5' N. and longitudes 4° 48' W. and 7° 31' E. from Greenwich (7° 8' W. and 5° 11' E. from Paris). It is bounded on the north by the English Channel, Strait of Dover, and North Sea; on the northeast by Belgium and Luxemburg; on the east by Germany, Switzerland, and Italy; on the south by the Mediterranean and Spain; and on the west by the Bay of Biscay, Atlantic Ocean, and the English Channel. In outline the country is roughly hexagonal, and its perimeter is about equally distributed between seacoast and frontier. The extreme length from the North Sea to the Pyrenees is about 600 miles; the greatest breadth from the extremity of Brittany to the Vosges is about 550 miles, and diagonally, to Mentone on the Mediterranean, about 675 miles. France ranks fourth in size among European countries; its area, according to official surveys, is 204,199 square miles, and, according to the determinations of the War Department, which are believed to be nearer correct, 207,060 square miles. Included in these totals are the island of Corsica and many small islands, with an aggregate surface of 3700 square miles.

TOPOGRAPHY. France possesses natural boundaries throughout, and is to a high degree an independent physical unit. The eastern border is girdled by the ranges of the Alps, the Jura, the Vosges, the Rhenish Highlands, and the Ardennes, which separate France from the countries of central Europe; the Spanish frontier is defined throughout its extent by the Pyrenees. The ranges on the east are broken in places by gaps and passes, through which commercial communication is maintained with the bordering States. The Pyrenees, however, present a great unbroken wall, communication with Spain being had around their extremities. On the northwest, west, and southeast the boundaries are formed by open seas, the total coast-line measuring about 1950 miles. Much of the coast-line is unbroken by important inlets, with the result that good harbors are comparatively few. Most of the harbors are river ports or are protected by breakwaters, as at Cherbourg. The northwestern coast, which confronts the southern shores of England, is intersected by the deep inlets of the Somme and the Seine, and has an irregular course, owing to the prominent peninsula of Normandy (called Cotentin), to the many capes, and to minor indentations. It varies in character from low, sandy stretches, as on the North Sea, to bold, rocky cliffs, such as are ex-

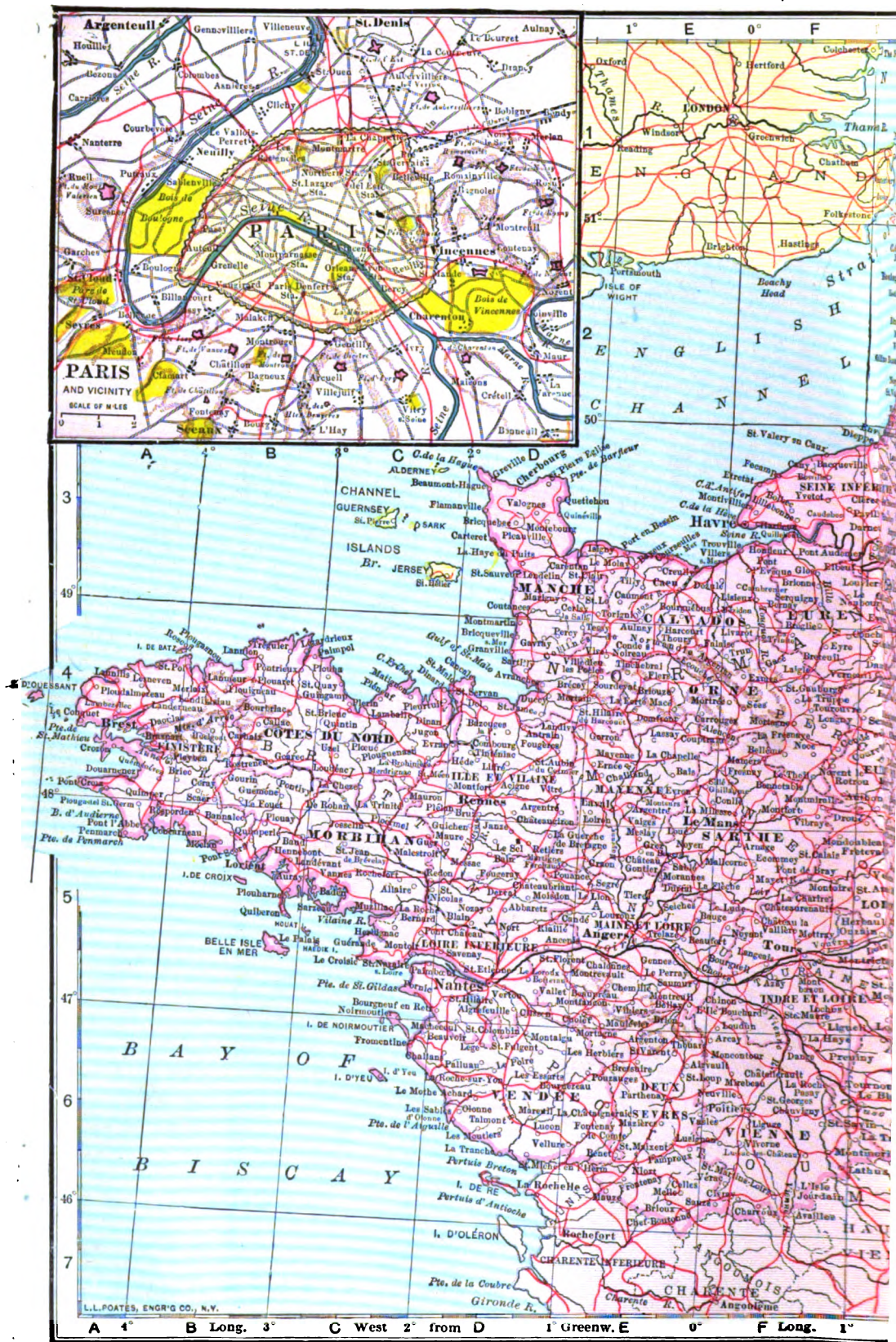
posed in the Pays-de-Caux, between Dieppe and Havre, and on the north coast of Brittany. Between the latter peninsula and Normandy is the broad indentation occupied by the Gulf of Saint-Malo, with the Channel Islands, comprising Jersey, Guernsey, Alderney, Sark, etc., which are held by Great Britain, although physically belonging to the mainland. The western coast, from Pointe Saint-Mathieu, the extremity of Brittany, to the Gironde, maintains an irregular outline, and is intersected by the bays of Douarnenez, Quiberon, Bourgneuf, by the Pertuis Breton, and the Pertuis d'Antioche, and by the estuarine mouths of the Loire and the Gironde. The low and generally sandy shore is fringed by islands, of which the largest are Ouessant (Ushant), Belle Ile, Ile de Noirmoutier, Saint Martin de Ré, and Ile d'Oléron. Southward of the Gironde the coast, formed by a straight, monotonous stretch of dunes, is bordered by the arid moors of the 'Landes,' the Bassin d'Arcachon being the only important indentation in this section. The Mediterranean coast, by which France enjoys easy access to Africa and the East, stretches in a broad double curve from the Pyrenees to the Maritime Alps. Bold and rocky on the extreme west, it soon becomes low and sandy, inclosing numerous lagoons, but without good harbors. Near the middle the Rhône has built its delta seaward, and incloses between its mouths the island of Camargue. East of the Rhône the shore conforms to the projecting spurs of the Provençal Highlands, and of the Maritime Alps, which shelter the harbors of Marseilles, Toulon, Cannes, and Nice.

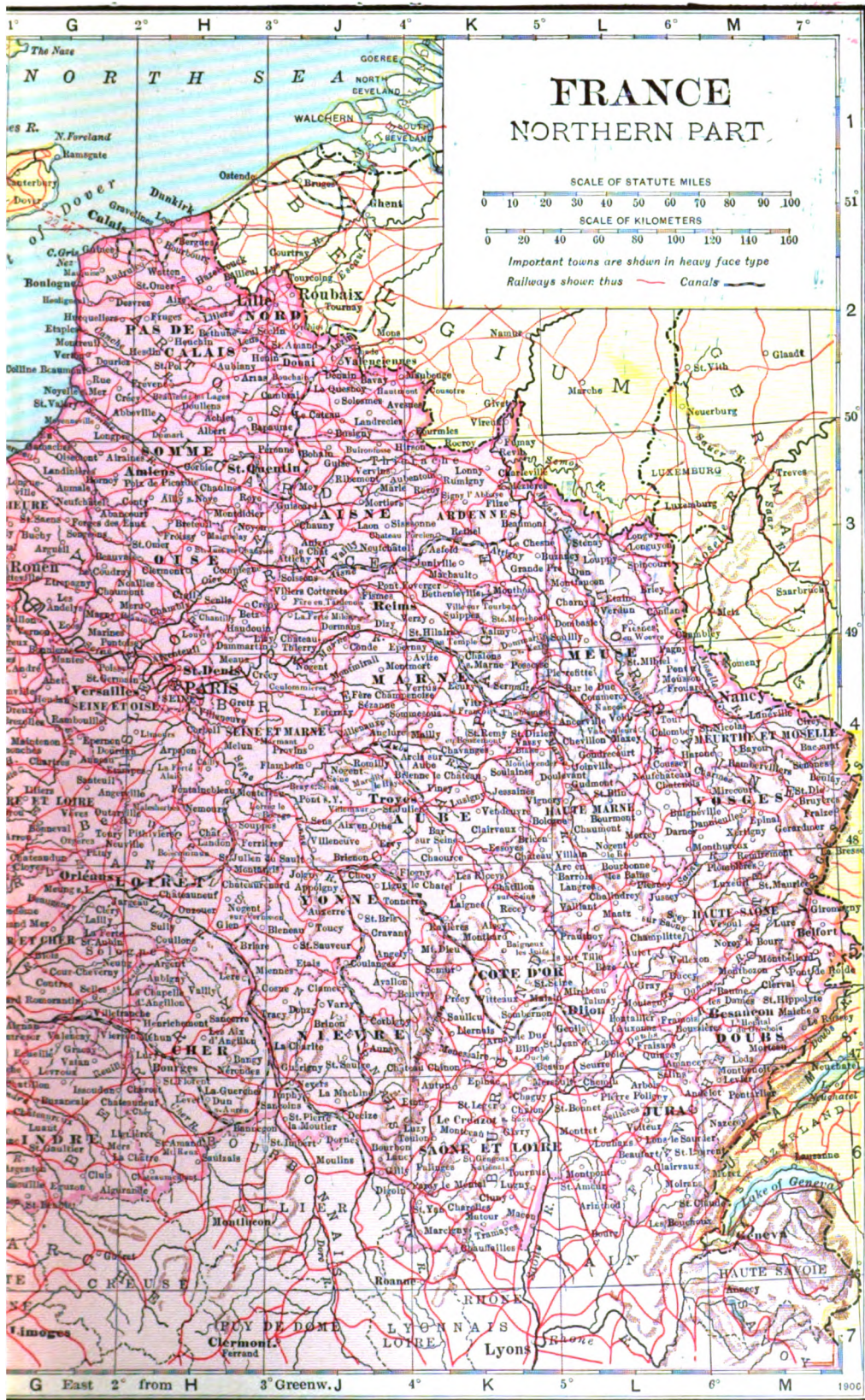
The physiography of France, broadly considered, falls naturally into regions that are determined, in their position and surface features, by the events of geological history. There are thus the regions of highlands on the eastern and southern borders, the great Central Plateau in the south-central part west of the Rhône Valley, the lower plateau of Normandy and Brittany, and the extensive plains in the north and west, occupied by the basins of the Seine, the Loire, and the Garonne. A line drawn diagonally across the country from Bayonne in the southwest to the Ardennes of southern Belgium in the northeast roughly divides the rolling low plains to the west of it from the central plateau and highlands to the east of it. The mean altitude of the country is about 1000 feet; but the western section averages less than 650 feet. As the chief relief is concentrated in the south and east, the land slope is toward the Atlantic; the Rhône alone, of the large rivers, takes a southerly course into the Mediterranean.

The Alps on the southeastern border are the most important highlands in the country. They extend from the Mediterranean north to Lake Geneva, a distance of 150 miles, and with the flanking chains and foothills they occupy the entire area between Italy and the Rhône Valley. The principal groups are the Maritime, the Cottian, the Graian, and the Pennine Alps; or, according to their situation in former provinces, they may be divided into the Alps of Provence, Dauphiné, and Savoy. The Maritime range on the extreme south enters France from Italy, where it has its culminating point, the highest peak across the border, French territory, being the Cime du Diable, 8816 feet. To the north the ranges increase in elevation, and the Cottian Alps are

crowned by the Aiguille de Scolette, 11,500 feet above the sea. Across Mont Genève a pass leads from the valley of the Durance, in France, to that of the Dora Riparia, in Italy, which has been used as a highway since ancient times. West of the Cottian range is the small group of the Oisans, culminating in Les Ecrins, 13,462 feet, and north of it are the lofty Graian Alps, snow-capped and carrying glaciers on their rugged slopes, with a crest averaging nearly 10,000 feet in altitude. Near their southern end are the Pass of Mont Cenis (8850 feet), and the railway tunnel of the same name, now the principal line of communication with Italy. The Alps culminate in Mont Blanc (15,781 feet), of the Pennine range; and thence northward to the shores of Lake Geneva there is a gradual decrease in altitude. Interrupted by the valley of the Rhône, the line of highlands is continued on the north by the Jura Mountains, which are formed by several parallel groups resting upon a plateau tilted toward the west, and thus falling to the valleys of the Saône and the Doubs. The Jura Mountains follow a nearly north direction at first, but gradually bend to the east and enter Swiss territory, where, or on the frontier of France, they attain their maximum elevation of over 5600 feet (Crêt-de-la-Neige). The Vosges Mountains, separated from the Jura by the gap at Belfort, now form a part of the French frontier, their eastern slopes fronting upon Alsace, which since 1871 has been incorporated into the German Empire. Their crest is a flat-topped mountain ridge, broken by peaks of 4000 to 4700 feet elevation, connecting in the southern part with the Monts Faucilles, a low range that extends westward in the form of an arc between the sources of the Saône and the Meuse and Moselle. A northern offshoot of the latter highlands stretches along the left bank of the Meuse, and is continued by the Forest of Argonne to the low plateau of the Ardennes, of which only a small portion lies in France. The Pyrenees, rising with great abruptness on the southern border, extend from the Mediterranean to the Bay of Biscay. A height of 9100 feet is attained in Mont Canigou, near the Mediterranean, and farther west this altitude is exceeded by Montcalm (10,000 feet), Pic Long (10,475 feet), Pic du Midi (9440 feet), and by others on the French side, and by still loftier elevations south of the border. In its conformation the chain is a true sierra, having a uniform crest line that is notched by slight gaps, usually but little below the level of the neighboring peaks. Passes, practicable for railways, are found along the low coast strips at the extreme ends; but between these points there are but few highways leading from France to Spain that can be traversed without great difficulty.

The Central Plateau, south of the Loire and west of the Rhône, is the chief physiographic feature of central France. The plateau rises sharply from the Mediterranean and Rhodanian depressions in several groups of highlands that are collectively known as the Cévennes. Beginning on the southwest with the Montagne Noire, at the passage of Naurouse, between the Aude and the Garonne, which lies at the base of the Pyrenees, the elevations include in their generally northeasterly course Monts de l'Espinousse, Monts Garrigues, and the Cévennes in the lesser sense, terminating with Mont Lozère (5584 feet).









Northward the range is continued by the Monts du Vivarais, with the volcanic Mont Mézenc (5755 feet), by the mountains of Lyonnais and Beaujolais, and by a succession of highlands to the elevated region of Côte d'Or, and the plateau of Langres, between the Saône and the sources of the Seine. The Central Plateau gradually falls off in elevation to the northwest, but in Auvergne it has been broken by volcanic eruptions. The denuded cones of the extinct volcanoes are still conspicuous in numerous minor elevations near Clermont-Ferrand, and in the more massive mountains—Puy-de-Dôme (4806 feet), Mont Dore (6187 feet), and Plomb du Cantal (6096 feet). South of the volcanic region the plateau receives a special character by the Causses, sterile limestone tablelands whose surface has been dissected by erosion into deep gorges and ravines. North of this region the low mountains of the Morvan range divide the waters of the Loire and the Saône. Bordering the Central Plateau are the fertile plains of central France on the north, the plains of Périgord and Poitou on the west, and the plains of Gascony across the Garonne on the southwest.

Normandy and Brittany (ancient Armorica) are to be considered as an isolated plateau whose surface, worn down by long-continued erosion, has a general altitude of less than 1000 feet. In Brittany the plateau is broken by two lines of highlands—the Monts d'Arée and the Montagne Noire—which run out to the two promontories that inclose the Bay of Douarnenez. The Monts d'Arée on the north culminate in Saint Michel (1285 feet), the highest peak in Brittany, and the Montagne Noire in Menez Horn (1080 feet). In Normandy the elevations are grouped along no general lines; but the surface shows an alternation of low hills and open valleys. The woodland region of the Norman Bocage, in the Department of Calvados, attains an elevation of 1000 feet in a few places, and in the Forest of Ecoves, near Alençon, Mont des Avaloirs rises to a height of 1370 feet.

Corsica, a part of France since 1768, belongs physically to Italy, with which it is united by a submarine plateau. It is traversed from north to south by a mountain range, which descends on the east to a narrow coastal plain, while westward it sends out spurs that project into the sea as promontories inclosing many good harbors. The interior of the island is wild and rugged, and is dominated by peaks of considerable altitude, the highest being Monte Cinto, 8900 feet above the sea.

HYDROGRAPHY. The large drainage systems of France are those of the Rhône, the Garonne, the Loire, and the Seine; the northeastern part of the country is included in the basin of the Moselle (which flows into the Rhine) and in that of the Meuse. The Rhône, which in point of discharge is the largest of the rivers, rises in Switzerland and enters France at the gap between the Alps and the Jura, flowing first southwesterly into the Rhodanian depression, where it is joined by its largest tributary, the Saône, from the north, and then sweeping to the south toward the Mediterranean. Through the Isère and Durance it drains most of the Alpine region of France, but has no important branches from the west. The basin of the Rhône covers an area of about 38,000 square miles. The Garonne, the Loire, and the Seine follow the gen-

eral land slope, and drain into the Atlantic. The Garonne, with a basin of 33,000 square miles, rises on the Spanish side of the Pyrenees, and flows in its middle course along the southwestern edge of the Central Plateau, from which it receives the Tarn-Aveyron, the Lot, and the Dordogne. At its mouth it widens to form the estuary of the Gironde. The Loire, the longest of the rivers, drains the great basin of west-central France, with an area of about 46,000 square miles. It rises on the slopes of Mont Mézenc, in the Cévennes, about 30 miles from the Rhône, and thus crosses the whole breadth of the Central Plateau. The chief branches of the Loire are: On the north, the Mayenne, Sarthe, and Loir, which unite to form the Maine; and on the south, the Allier, Cher, Indre, and the Vienne-Creuse. The Seine collects the waters from the northern part of the Central Plateau, over an area of about 30,000 square miles. From the north it is joined by the Oise, Marne, and Aube, and from the south by the Yonne and Eure. Besides the four great river systems, there are several minor streams of importance, such as the Somme, Orne, Vilaine, Charente, Adour, Aude, and Hérault, the last two flowing into the Mediterranean. More than 200 rivers are officially reported as navigable, for an aggregate distance of about 6000 miles. Even the largest, however, show such fluctuations in volume between periods of floods and low water that they are not continuously navigable except by light-draught boats. The Seine is most important for commerce, being navigable for river boats beyond Paris. The utility of the natural waterways is much augmented by the extensive systems of canals that connect them; so that, for example, the canals on meeting the eastern and western rivers provide waterways across France to Belgium and Germany; the northwestern seaports of Brest and Saint-Malo are joined by river and canal with the Loire; and the Gironde is extended by canal to the Mediterranean. About one-fourth of France's internal trade is carried on the waterways. There are but few lakes in France. Aside from the brackish or fresh-water lagoons along the coast, the largest are in the Alps, within the Rhône Basin. The largest of these, Lake Geneva, belongs only in part to France, the northern shore lying in Switzerland. Other well-known lakes of this region are Annecy and Bourget.

CLIMATE. The climate varies considerably between the coastal and the elevated interior regions, but it is characteristically temperate. On the Atlantic seaboard the temperatures are equalized by the warm ocean currents and southwesterly winds; toward the interior the extremes of winter and summer are more marked, and the isotherms trend steadily southward. The temperatures at Brest average for the year about 52° F., for January 43°, and for July 63°, while at Paris the yearly mean is 50°, the January average 36°, and the July average 65°. On the eastern frontier the climate has a continental character, the winters being long and severe and the summers hot. Thus, at Nancy, which is nearly in the same latitude as Paris, the annual mean is 48°, the January mean 32°, and the July mean 65°. The greatest contrast is exhibited between the bleak climate of the Central Plateau and the eastern highlands, and the warm, almost subtropical, climate of the Mediterranean coast.

The prevailing winds blow from the south and west, and from the north and northwest. The southerly and westerly winds, being warm and moisture-laden, are responsible for the most of the rainfall. A local wind, the 'mistral,' which descends from the Central Plateau upon the Mediterranean coast, is remarkable for its constancy and force. At Marseilles it blows on an average 175 days in the year, sometimes with such violence as to overturn railway trains and to denude trees of their foliage. It has a chilling effect; but by clearing the atmosphere it brings sunshine and healthfulness to the region. The rainfall, which averages about 30 inches for the whole country, is greatest along the seacoast, and in the elevated regions of the Cévennes, the Pyrenees, and the Alps, where the annual precipitation usually exceeds 40 inches. The smallest average (10 inches) is found in certain interior districts of the northern plains.

FLORA. The flora of France is typical of that of Continental Europe, since plants indigenous to each region may be found in some part of the country. Except on the summits of Mounts Cantal and Dore, which were more recently formed than their neighbors, the mountain crests are tipped with species of lichens and mosses peculiar to the Arctic-Alpine regions. With lessened altitude appear species in a succession similar to their sequence in decreasing latitude—mustards, crow-foots, dwarf willows, and birches. With continued descent the trees, shrubs, and herbs characteristic of northern European forests are met with—pine, spruce, ash, beech, and oak. As the level of the sea in the south of France is approached, species indigenous to that latitude are encountered—chestnut, poplar, mulberry. The products of the northern districts and of the higher elevations are wheat, rye, oats, grapes, apples, and pears; of the middle, corn, potatoes, peaches, apricots, cherries, and strawberries; of the southwestern, grapes, prunes, figs, and various nuts; and of the Mediterranean coast, oranges, lemons, olives, and pomegranates. See DISTRIBUTION OF PLANTS; ECOLOGY; and the paragraph on *Flora in EUROPE*.

FAUNA. The fauna of France is representative of Western Europe. The wide variety of climate and physical features its extensive surface affords gives room and conditions for a great diversity of animal life. A sixth or more of its surface is covered with forests; and lofty mountains, broad, sandy plains, and a great length of coast offer suitable homes for representatives of the whole fauna of temperate Europe. Many large quadrupeds have become extinct or have been reduced to a semi-domestic condition during the centuries of human occupation. An account of the aboriginal fauna and its partial disappearance is given under EXTINCT ANIMALS. Bears still survive in the Pyrenees, and wolves lurk in the forested foothills of the mountains along the Swiss and Italian borders. Wildcats are very rare, but a civet (the genet) and foxes are not uncommon, while several weasel-like carnivores occur widely. The higher mountains contain a few chamois; the mouflon remains in Corsica; and the native wild boar and fallow deer are preserved on many private estates. The porcupine is the most interesting of the many rodents as a survival near the Mediterranean of ancient forms. The birds embrace a very large list, most of which are common to all Europe. Regular routes

of migration between northern latitudes and Africa traverse France, one by way of Spain and the Atlantic coast, another across the Mediterranean by way of Sardinia and Corsica, and thence into and beyond France along the valleys of the Rhône, Loire, Saône, and Meuse. Some peculiar southern birds occasionally appear, as the sand-grouse; and others are habitually present in the south of France, as the bee-eater and hoopoe. The great coast-line brings all of the wandering sea animals of the North Atlantic to French shores, which are rich in fisheries, oyster banks, and plantations, and littoral life generally. The Mediterranean gives a separate sea fauna. Among reptiles only the adder, more or less observable everywhere, need be mentioned. Cyprioids are the most characteristic inland fishes. See EUROPE; DISTRIBUTION OF ANIMALS; and articles upon neighboring countries.

GEOLOGY. The Central Plateau is the geological nucleus of France, around which sedimentary strata have been deposited during the Paleozoic and succeeding periods. In this region the rocks comprise granites, gneisses, and schists of Archæan character, overlaid in places by later volcanic flows of basalt and trachyte. The northern and western plains were built up during Mesozoic and Tertiary times by sedimentary accumulations along certain lines that correspond generally with the present basins of the Seine, the Loire, and the Garonne. Normandy and Brittany, however, are of more ancient (Paleozoic) formation, and resemble in geological structure the southwestern part of England, with which this portion of France was once united. The bordering highlands were uplifted at different times. The Ardennes and the Vosges consist of early Paleozoic strata, with small areas floored by Devonian and Carboniferous, the latter containing the most important coal deposits of the country. The Jura range has lent its name to the Jurassic system, which here includes thick beds of limestones and sandstones that are continued eastward into Germany. In the Alps the central granite axis is flanked by Mesozoic strata, upturned and sharply folded. The Pyrenees did not assume their present form until late Tertiary times, when there was an extensive upheaval which parted the waters of the Mediterranean and the Atlantic. Between the Central Plateau and the eastern highlands an arm of the sea once extended as far north as the Paris basin; its bed was elevated at the close of the Pliocene, and has since been occupied by the basin of the Rhône.

MINERAL RESOURCES. The coal-fields of France, while they are limited to the comparatively small area of about 2100 square miles, are the most valuable of the nation's mineral resources. The deposits are distributed over a number of small areas, including those of Nord and Pas-de-Calais (Valenciennes), which together yield 60 per cent. of the total production, and those of the Loire (Saint-Etienne), Nivernais (Le Creusot), Gard (Alais), Bourbonnais (Commeny), Tarn, and Aveyron. They furnish a good quality of bituminous coal, suitable for fuel purposes and to a less extent for iron-making. Small amounts of anthracite are mined in the Department of Isère, and about 600,000 tons of brown coal are produced annually from the deposits near Marseilles and in the Pyrenees. The output of coal in France has shown a small but

steadily increase during the last decade, amounting in 1900 to 33,404,298 metric tons, against 26,093,118 tons in 1890; yet the supply is insufficient to meet the home consumption, though the chief fuel used for domestic purposes is wood, and from 10,000,000 to 12,000,000 tons are imported annually. The development of manufacturing industries is retarded by lack of fuel, and especially by the high rates of transportation, which raise the price of coal up to \$8 per ton or more in the districts far from the mines. These conditions have necessitated the extended use of water-power, with which the country fortunately is well supplied. The coal-mining industry employs about 160,000 laborers, and the value of the annual product is nearly \$100,000,000.

Iron ore is extracted from the Jurassic rocks in the Department of Meurthe-et-Moselle and at Vassy in Champagne. Some ore is produced also in the Pyrenees and in the departments of Gard, Isère, Haute-Marne, and Saône-et-Loire. It is to the disadvantage of France's industries that her coal has to be brought to her iron, as the deposits are found together only in the districts around Le Creusot and Saint Etienne. In iron and steel manufacture France ranks about on an equality with Russia, and is surpassed by the United States, the United Kingdom, and Germany. The output of pig iron in 1900 was 2,699,494 metric tons, and of steel 1,624,048 tons, as compared with 1,962,126 tons and 581,998 tons respectively in 1890. To make this production about 2,000,000 tons of foreign ore were required in addition to the domestic supply. The chief centres of the iron and steel industry are Fives-Lille (Nord) and Le Creusot (Saône-et-Loire), the latter city rivaling Essen in Germany in its great establishments for turning out heavy ordnance and steel castings. In the production of other metals France has no special prominence. Copper is smelted near Lyons and in the Department of Pas-de-Calais, foreign ore being used almost entirely. The output in 1900 was 6466 metric tons. The production of zinc for the same year was 36,305 tons; of lead, 15,210 tons; of nickel, 1700 tons; of antimony, 1573 tons; and of silver, 85,646 kilograms. Most of the lead, zinc, antimony, and silver product was derived from domestic ores, while the nickel was imported from the French colony of New Caledonia.

In building materials and quarry products generally France is well endowed. The stone industry gives employment to more than 100,000 laborers, and the annual product is valued at about \$15,000,000. Marble is quarried in the Alps and Pyrenees, granite, sandstones, and limestone in numerous localities. The French millstones, celebrated for their good quality, come from Ardèche. The value of the roofing-slates, mostly from the Ardennes, which amounted to \$3,427,985 in 1900, is second only to that of the output of Great Britain. Phosphate rock, used in the manufacture of fertilizers, is quarried in the departments of Meuse and Pas-de-Calais, the product in 1900 amounting to 587,919 metric tons, valued at \$2,827,291. Large quantities of this material are mined by French companies in Algeria, and shipped to France for manufacture. The output of salt in 1900 was 1,088,634 tons, this amount representing both rock and brine salt from the departments of Doubs, Jura, Basses-Pyrénées, Haute-Saône, and Meurthe-et-Moselle, and sea-salt from the Atlantic and Mediterranean coasts. Clay,

gypsum, asphalt, bituminous rock, mineral paints, and lime are produced in quantities generally sufficient to meet the home consumption.

The mineral springs of France are numerous and of varied character. They are situated mostly in the mountain district of Auvergne, and in the regions bordering the Alps, Vosges, and Pyrenees. The places best known for their baths and medicinal waters are Aix, Aix-les-Bains, Enghien, Bagnères-de-Bigorre, Bagnères-de-Luchon, Barèges, Vichy, Dax, Plombières, Bourbonne-les-Bains, Bourboule, Forges-les-Eaux, and Saint-Sauveur.

FISHERIES. The fishing industry is on a vast scale, giving employment to over 155,000 people. The value of its products exceeded \$17,000,000 in 1888, and rose to more than \$24,000,000 in 1898. Pilchards and mackerel are caught in large quantities off the coasts of Normandy and Brittany. The western coasts have extensive oyster and mussel beds; tunnies and anchovies are caught on the shores of the Mediterranean. French boats fish in the North Sea, at the Newfoundland fisheries, and off the coast of Iceland. Oyster-breeding is constantly growing in importance; in 1897 967,000,000 oysters were procured in that way as compared with but 100,000,000 in 1881. French oysters are smaller and somewhat inferior to the American product. Sardine-packing is another lucrative branch of the fishing industry, and receives Government subsidy exceeding \$1,000,000 annually.

AGRICULTURE. Its geographical position, fertile soil, and mild climate combine to make France an agricultural country. Agriculture has been the chief occupation of its inhabitants for centuries, and the French peasant and landlord have been distinguished for their quickness in adopting improved methods of cultivation following the discoveries of science; at the present day agriculture furnishes employment to more than 6,600,000 people. The most fertile sections of the country are in the north and northeast, and along the valleys of the Garonne and Rhône. The least productive are the marshy *landes* of the southwest and the mountain regions of the Pyrenees and Alps. The cultivation of cereals, wine-growing, and cattle-raising are the principal branches of agriculture. Nearly 84 per cent. of the total area of the country is productive; about 12 per cent. consists of sand, rocks, marshes, and other unproductive surface. The remaining 4 per cent. represents urban and other non-agricultural land.

CEREALS. More than 57 per cent. of the land under cultivation and more than one-fourth (over 28 per cent.) of the total area of the country is devoted to the production of cereals. This area, 36,637,517 acres, is second only to that of Russia in the whole of Europe. Nearly one-half of this area is devoted annually to the production of wheat, which gives it first place in order of importance. Unlike other European countries, notably Great Britain, which have found it necessary to curtail the cultivation of wheat because of American competition, France has fairly held her own in that regard, the area under wheat at the close of the last century having declined less than 2 per cent. since 1862. The area devoted to it in 1899 was 17,141,806 acres, or about eight times that of Great Britain, the yield for the same year being 362,666,600 bushels. Wheat is largely raised in the north, in the west, in the central parts, and in the basin of the Garonne. Previous to 1860 rye bread was the staple food

of the peasantry, but after that time they began to discard rye for wheat, so that the people now, though consuming much rye, are preëminently a nation of wheat-eaters. The relative importance of the various grains raised in France is shown (census of 1892) by the following table:

	Per cent. of total area under cereals	Per cent. of total value of cereals
Wheat.....	48.3	58.7
Oats.....	25.7	20.2
Rye.....	10.6	9.5
Barley.....	5.7	4.5
Buckwheat.....	4.1	2.3
Corn.....	3.6	2.8

As may be seen from the above figures, oats is next in importance to wheat, occupying more than a fourth of the total area under cereals, and yielding one-fifth of their total value. France ranks third in Europe, next to Russia and Germany, in the extent of area devoted to oats, and is second only to the former in the yield of that crop. The area under oats increased about 15 per cent. in the last forty years of the century. Rye, barley, buckwheat, and corn all declined in importance, as the following figures show:

AREA UNDER CULTIVATION

	Thousands of acres		Per cent. decline
	1862	1900	
Rye.....	4,764	3,509	26.0
Barley.....	2,666	1,871	43.6
Corn.....	1,460	1,337	7.8
Buckwheat.....	1,663	1,490	9.9

Corresponding to the decline in area there has been a decline in the production of grain. Thus the total cereal crops of France rose from 745,166,600 bushels in 1862, to 835,833,300 in 1882, declining to 759,333,300 in 1892 and 733,166,600 bushels in 1900.

FRUIT AND VINE GROWING. France is famous for her fruit, and especially for the product of her vineyards. Apples, plums, pears, peaches, and cherries abound in the north and central parts of the country, while the orange, lemon, and olive thrive in the south. Nuts also grow in great abundance. The annual crop of the French orchards and nut-bearing trees is valued at about \$45,000,000, of which the various nut products constitute more than 40 per cent. The most important of these is the chestnut, the annual value of which, some \$7,000,000, is the largest single item in the revenue of the French nut-growers. It grows on the poorer lands of the country, and in the mountainous regions of Auvergne and Corsica, and constitutes a staple food of the inhabitants. The vine has from a very early period constituted one of the principal sources of the agricultural wealth of France. The mild climate and the soil of the country are especially adapted to its cultivation. The choicest grapes are grown in Bordeaux, Burgundy, and Champagne, but some excellent kinds are produced on the banks of the Loire and in some of the southern departments. The area devoted to this culture has diminished during the last quarter of the century. In 1901 the area was about 4,324,250 acres, as compared with 5,552,300 in 1875. The vine culture has

from time to time received serious checks through attacks by the fungus known as the *oidium*, which inflicted such serious damage that in 1854, the worst year, the acre yielded less than one-fourth of its average quantity. Another destructive disease is caused by the ravages of an insect known as *Phylloxera vastatrix*.

The damage wrought by these diseases is shown by the fact that the average yield per hectare, which steadily rose from 562.07 gallons in 1788 to 857.28 gallons in 1850, began to decline after that year until it fell to 485.48 gallons in 1892. In 1878 the French Government took the first step to combat the evil. By a series of legislative enactments calculated to encourage a war of extermination against the insect, the Government finally succeeded to such an extent that in 1900 the yield per hectare rose to 1031.38 gallons. The most effective means of overcoming the ravages of phylloxera was the importation of American vine stock upon which the French vines were grafted. The following figures illustrate the progress of the wine industry in the nineteenth century. In 1808 there were produced 742,000,000 gallons; in 1829, 820,784,500; in 1848, 1,367,983,000; in 1880, 789,832,500; in 1890, 726,524,000; in 1900, 1,784,854,500.

Stock-raising is of secondary importance in France, domestic stock being far from sufficient to meet the home demand. In 1840 the area of pasture land was 14,260,000 acres; in 1862 it increased to 19,258,980; in 1882 to 22,426,790; in 1892 to 23,358,360. In 1900 the natural or permanent pastures covered an area of 13,753,580 acres, as compared with about 14,828,000 in 1892. There were 14,521,000 cattle in 1900, as compared with 13,709,000 in 1892 and 12,997,000 in 1882. The dairy industry flourishes, especially in the north, where the products are exported to England. Horses are raised principally in the north and west. The raising of fine breeds is an object of special care on the part of the Government in the interests of the army. The number of horses has, on the whole, been stationary since 1862, the figures in 1862, 1882, and 1900 being 2,914,000, 2,838,000, and 2,903,000 respectively. Sheep-breeding is important. However, in spite of the efforts of wool-growers, the number of sheep declined from over 32,000,000 in 1842 to 29,500,000 in 1862, 23,800,000 in 1882, and 20,200,000 in 1900, a decline which had to be covered by importations. In 1900 more than 1,000,000 were imported. The number of hogs, which was on the increase until 1892, declined during the last decade of the century, being but 6,740,000 in 1900, as compared with 7,421,000 in 1892. The best breeds are raised in Champagne and the Pyrenees. Importation is necessary to meet the home demand. Goats, mules, and asses are among the animals of the French peasant. The exports of poultry, eggs, and feathers net several millions of dollars annually. Apiculture is also well developed; there were more than 1,600,000 beehives at the close of the century, yielding an annual product of honey and wax, valued at more than \$3,000,000.

INDUSTRIAL PLANTS. Beets owe their importance to the manufacture of beet-sugar, which originated during the early part of the nineteenth century. During the prevalence of the vine-disease, beets were employed in the manufacture of alcohol. The cultivation is carried on chiefly in

the north and east; the area devoted to that plant increased from 509,520 acres in 1890 to 626,400 in 1900. The exports of beet-sugar exceeded the imports during that year by over half a million tons. Hemp and flax are grown chiefly in the north. Their cultivation is greatly on the decline, the area having decreased from 158,150 acres in 1880 to less than 44,475 in 1900; as a result, a considerable quantity of flax is imported each year. The cultivation of the mulberry-tree, introduced in the reign of Henry IV. (1589-1610), derives importance from its bearing on the production of silk. This industry receives assistance from the Government and is carried on in twenty-seven departments, the chief being Drôme, Gard, Ardèche, and Vaucluse. Nearly 150,000 persons are engaged in silk culture. For years after 1860 the production increased, though it has always fallen far short of 1850, when 25,000,000 kilograms of cocoons were raised. The average of the last decade of the nineteenth century was 8,000,000 kilograms of cocoons or 2,000,000 kilograms of raw silk. Between 1894 and 1900 the production slowly declined, the growers being discouraged by unsatisfactory profits. The production of raw silk is less than one-fifth of that of Italy. Of the other industrial plants tobacco and hops are the most important. Tobacco production, manufacture, and sale is a Government monopoly and a source of large revenue. Production is restricted to twenty-five departments, the cultivation of the plant being forbidden whenever the yield falls below a certain quantity.

LAND TENURE. France is a country of small farmers, the inheritance laws having contributed to the extreme parcellation of the agricultural land. According to the census of 1892 there were 5,702,752 farms, with a total area of 122,015,000 acres, distributed as follows:

SIZE OF FARMS	Per cent. of total number of farms	Per cent. of total area under farms
Less than 2.5 acres.....	39.19	2.67
From 2.5 to 25 acres.....	45.90	22.80
From 25 to 100 acres.....	12.48	28.98
More than 100 acres.....	2.43	45.55
Total.....	100	100

These figures show that while the number of small farms is very large, the ownership of the greater part of the land is concentrated in comparatively few hands. Less than 15 per cent. of all the owners possess more than 74 per cent. of all the land. The contrast is even more striking when from this category we exclude those owning comparatively small farms of from 25 to 100 acres; we then find less than 2.5 per cent. of all the owners possessing nearly one-half (45.55 per cent.) of all the land, leaving the remaining half to be divided among 97.5 per cent. of the farmers. Comparing these figures with those of the census of 1882, we find that while there was a slight falling off in the number of farms in the three highest groups, the area in the highest and lowest groups increased, while in the two intermediary groups it fell off. In other words, while the largest estates absorbed still more land, the small independent peasants were losing ground, thereby swelling the number of very small peasants whose holdings—less than 2.5 acres to a

farm—are so small as to compel them to seek additional employment on the large estates. Thus France has not escaped the process of elimination of the medium-size self-sufficing farm, and is slowly tending to the English type of land distribution into large estates and small plots, the latter serving merely as a subsidiary source of income to their owners. The proportion of tenants to owners is not very large as compared with other countries, especially England, the figures being: Those cultivating their own land, 79.8 per cent.; tenants renting land for a fixed money payment, 13.8 per cent.; and tenants working for a share of the crops raised by them on the rented land, 6.4 per cent. Those of the first class, however, cultivate but 60 per cent. of the entire farm area; those of the second, 27 per cent.; and of the third, the remaining 13 per cent.

According to the character of the owners, the land is divided as follows: 2.42 per cent. belongs to the State, 0.02 per cent. to the departments, 8.79 per cent. to the communes, 0.87 per cent. to charitable and other institutions, and 87.9 per cent. to private individuals. The betterment of agricultural conditions in France is elaborately provided for by the National Department of Agriculture. This department has established under one central authority a much more comprehensive and closely coördinated system of agricultural education than is known in America. The schools are adapted to local needs. Not only is instruction in agriculture a branch of the general course in the public schools, but there are practical schools of apprenticeship especially for the training of the peasant laboring class.

FORESTS. The principal forest trees are the chestnut and beech in central France; the oak and cork tree in the Pyrenees; and the fir in the Landes. The pinaster is extensively cultivated along the southwestern coast on account of its usefulness in reclaiming the low seacoast and because of its rich yield of turpentine. The destruction of the national forests has been enormous within the last two centuries, but measures were taken as early as 1827, and especially in recent years, to plant new woods in order to protect those mountain slopes which are exposed to inundations from Alpine torrents. The forests of France at the close of the century embraced 23,749,000 acres, about one-sixth of the total area of the country. Nearly two-thirds of the area under forests is in private hands, while one-third is in the hands of the national, departmental, and communal governments.

MANUFACTURES. For centuries France held a preëminent position as a manufacturing country. She no longer holds that high rank among the industrial nations of the world. The fame of French industry was due to the skill of her craftsmen, which was developed through generations. With the advent of modern industrial appliances, the conditions for the success of which are not so much technical skill as an abundant supply of raw material, especially coal and iron, France was at a disadvantage. Not possessing the natural resources which insure cheap power and industrial operations on a large scale, the country has been tremendously handicapped in the international contest for the world's markets. Those manufactures which are most successfully produced are largely confined to those industries or branches of industries whose

products are noted for their superior artistic finish, and they do not, therefore, come into direct competition with British manufactures. The more important industries are the textile, metal, paper, chemical, glass, and pottery industries. Several other branches of manufacture redound to the fame of France by the elegance and beauty of their products, but they are of minor importance from the point of view of net financial returns. Such are the glove industry of Grenoble and Paris, the Gobelin tapestry, costly shawls, watches, clocks, articles of vertu, carriages, scientific instruments, manufactured mostly in Paris, the matchless china and glass of Sèvres, the fine furniture of Paris and Bordeaux, and many other articles of comfort and luxury. The textile industry is by far the most important, the annual output being valued at about \$600,000,000. This includes woolen, cotton, silk, and linen manufactures, enumerated in the order of the value of their products. The woolen industry employs about 160,000 people in more than 2000 mills, turning out about \$240,000,000 worth of goods per annum. It is carried on chiefly in the departments of Nord, Ardèche, Marne, Somme, Aisne, and Tarn. The more costly of the products of the industry, such as the Paris and Lyons shawls, the Rouen, Roubaix, and Sedan cloths, are in demand all over the world. While exporting enormous quantities of woolen goods, France has to import a good deal of raw wool, owing to the decline of the domestic output. The cotton industry, centring chiefly in the departments of Nord, Vosges, Eure, Aube, and Seine-Inférieure, employed about 150,000 persons at 5,200,000 spindles and 95,000 looms in 1900, as compared with about 100,000 persons and 4,376,000 spindles in 1890. The industry dates in France from 1773. Its annual output is valued at about \$120,000,000. The silk industry, while ranking third in the value of its output, excels in the artistic finish of its products. The annual value of these is estimated at about \$100,000,000. The silk-mills furnish employment to about 80,000 workers. Hand-loom weaving is rapidly declining; the chief seat of this house industry is in the Department of Rhône. In the production of linen goods France leads in the matter of style, quality, and design. The linen industry flourishes chiefly in the north, the name of Lille, Cambrai, and Valenciennes having become identified everywhere with the finest qualities of linen. No less famous are the lace manufactures of Paris, Saint-Etienne, Lyons, and Nantes.

The metal industry is next in importance. While there are large iron and steel mills in the mining region, the departments of Nord, Meurthe-et-Moselle, Loire, and Pas-de-Calais, France is far behind such countries as the United States, Great Britain, and Germany in that field, and has to resort largely to imports of machinery. It is known, however, for the fine qualities of its smaller metal ware, such as safes, hardware, steel pens, locks, files, needles, etc. The excellence of French gold and silver ware is a matter of common knowledge. The manufacture of jewelry, watches, and optical instruments deserves mention. At the opening of the twentieth century the paper industry engaged about 40,000 people in 600 paper-mills, producing some \$60,000,000 worth of goods annually. In 1885 the

number of mills barely exceeded 500, employing about 30,000 workmen and turning out products valued at but \$23,000,000. The manufacture of glass and pottery furnishes employment to some 30,000 people, and the annual output is valued at about \$25,000,000. In addition to the superb china and porcelain ware of Sèvres there should be mentioned the famous mirror-works of Saint-Gobain and Montluçon, and the imitation jewels and glass prisms. The chemical industry ranks probably next to that of Germany, the more important branches from a commercial point of view being the manufacture of perfumes, soap, and candles. Beer-brewing is increasing in importance, the consumption of beer growing at the expense of wine, especially by the poorer classes. From about 185,500,000 gallons in 1880, the annual production of beer rose to over 238,500,000 in 1900. The production of wine has kept pace with vine-growing, and French cognac still leads the world. The tobacco industry is a Government monopoly. The growth of large modern industries may best be seen from the increased use of steam-power, as shown by the following figures: In 1840 the engines and motors employed in the industrial establishments of France, not counting the railways, were capable of developing 2591 horse-power; in 1870 the horse-power exceeded 320,000; in 1890, 863,000; and in 1899, 1,865,000, showing an increase of more than 100 per cent. in the last decade of the century.

TRANSPORTATION. In 1900 the railways of France had a total length of nearly 26,000 miles, Germany and Russia being the only European countries containing a greater mileage. In the same year there were 12.75 miles of line for every 100 square miles of area, which was exceeded by a number of the western European countries, but was twice as great as the corresponding figure for the United States. The railway system of France converges, with the exception of one road, upon Paris as a centre. It consists of six large divisions (not counting the State line), which constitute the great trunk lines of the country. A thorough grasp of these is essential to a clear understanding of the principal economic divisions of the country and their effect upon its industrial and commercial development. These lines are as follows, in their geographic order: the Northern, the Eastern, the Paris-Lyons-Mediterranean, the Southern, the Paris-Orleans, and the Western.

The most important is the Paris-Lyons Mediterranean Railway, running, with its numerous branches, nearly 5600 miles through the richest section of France, connecting the two largest cities of the country, Paris and Marseilles. It commands the traffic of the Rhône Valley as well as that going to and from Switzerland, Italy, and southern Germany. Its capital stock is 4,462,539,247 francs, over \$892,000,000.

The Paris-Orleans Railway extends beyond Orleans to the west and south through Tours to the ports of Nantes and Bordeaux and has its southern terminal at Toulouse, where it joins the Southern Railway. It passes through a rich agricultural country, serving as an outlet for its products, which it takes to the Atlantic ports just mentioned, to the Mediterranean through the Southern Railway, and to Paris and the northern region of France. Its total length is about 4500 miles, and the capital stock 2,273,-

\$12,946 francs (about \$455,000,000). The Southern Railway is the only trunk road that does not terminate in Paris. It traverses the south of France from east to west, joining the two roads just described. The principal terminals of the line are Bordeaux, on the Atlantic, and Cette, on the Mediterranean. At the latter point it joins the Paris-Lyons-Mediterranean line, and connects at Perpignan and Bayonne with the railways of Spain. It is the shortest trunk line in France, its length being about 2200 miles, and capital stock 1,046,016,767 francs (about \$200,000,000). The Northern Railway, extending from Paris northeast to the Belgian frontier and northwest to the ports situated on the English Channel, passes through the richest mining region of France. It handles the traffic with England and Northern Europe and has terminals in the ports of Dunkirk, Calais, and Boulogne, besides passing through the important textile centres of Lille, Cambrai, Valenciennes, Arras, etc. It is about 2300 miles long, with a capital stock of 1,649,642,669 francs, or about \$330,000,000.

The Eastern Railway covers the territory lying between the Northern and the Paris-Lyons-Mediterranean Railways. It is of great strategic value, since it extends directly east of Paris toward the German frontier. Though not connecting the same terminals, it competes with the two railways mentioned above, since it carries traffic to Belgium and northern Germany over Mézières, to Switzerland over Belfort, and to South Germany over Nancy. It has a length of about 2800 miles and a capital stock of 2,083,753,828 francs (about \$417,000,000). Finally, the Western Railway, extending from Paris over the northwestern and western parts of France, terminates in a number of ports on the English Channel and the Atlantic, notably Dieppe, Havre, Cherbourg, Saint-Malo, and Brest. It is in a position to compete with the two adjoining roads, the Northern on the northeast, and the Paris-Orleans on the southwest. Its length exceeds 3700 miles, and its capital stock is 1,943,015,204 francs, or more than \$588,000,000. The State railways cannot be said to form a trunk line, since they are not all contiguous, but form an irregular, broken net, intersecting at many points the other roads. Their length is about 1700 miles. The roads of France will thus be seen to cover each a distinct territory, distinct both in the sense that each territory is traversed by one road only and that each forms a distinct economic entity. The Northern road may be called a coal-carrying line, the Paris-Mediterranean a carrier of finished products, and the Paris-Orleans a grain-carrier.

The operation of Government and private railways side by side is the result of a long series of experiments. Since 1842, when the first law regulating the construction and operation of railways went into effect, the country has passed through a number of stages, each having its effect on the railways. The present status is the result of the law of 1883, which left the principal lines in private hands, but under strict Government control. According to the charters of the railways, their franchises expire between 1950 and 1960, when the entire railway property will pass to the State without any compensation. The Government, in 1883, turned over nearly all of the lines to private companies

without any compensation. New construction is done by the Government, the companies being assessed for the purpose 25,000 francs per kilometer, a little over \$8000 per mile, about one-tenth of the actual cost. For the remainder the companies advance the money to the Government, which the latter pays out in annuities at a certain rate of interest, after deducting the amounts due to it for sums advanced to the railways for the payment of dividends. The State guarantees a minimum dividend to the stockholders. In the event of inability of a road to declare the minimum dividend on the capital stock, the State advances the required sum, which, with the accrued interest, goes to make up the debt of the road to the State, payable from the profits of succeeding years. When the profits exceed a certain rate (which varies with the different roads) the Government is to receive two-thirds of the surplus. From 1883 till 1893 the deficits continued to increase, rising from 28,000,000 to 95,000,000 francs; but since 1893 they have been steadily diminishing, so that in 1899 they were only 9,000,000 francs—two roads only, the Western and the Southern, recurring to Government aid during that year, as against three in 1898 and four in 1897. The growth of railways has been as follows:

	Miles
1850.....	1,916
1870.....	11,140
1890.....	22,925
1900.....	26,370

ROADS. The French highroads have world-wide fame. The laying of the first is attributed to Philip Augustus, and their more perfect organization during the sixteenth and seventeenth centuries was due to Henry IV. and Louis XIV. According to the authorities charged with their maintenance, these roads are divided into three kinds: national, departmental, and communal.

COMMERCE. The general commercial policy of the French Government was that of protection during the entire nineteenth century, changing from the high tariff of 1816 to the more liberal one of 1860. The unfortunate condition in which France found herself after the war of 1870-71 demanded higher tariff duties for fiscal purposes, but, owing to existing treaties with other countries, they could not be introduced before 1882, when a new general tariff was adopted raising the duties about 25 per cent. Treaties for a term of ten years terminating in 1892 were entered into with most of the European countries, of which Germany, Russia, Turkey, and Rumania enjoyed the privilege of the 'most favored nation' clause. Subsequent changes in the tariff have all been designed to make it more prohibitive. The table below shows the development of commerce during the latter half of the century:

YEAR	Imports, francs *	Exports, francs *
1860.....	1,897,000,000	2,277,000,000
1870.....	2,867,000,000	2,802,000,000
1880.....	5,033,000,000	3,468,000,000
1890.....	4,387,000,000	3,753,000,000
1900.....	4,698,000,000	4,109,000,000

* A franc equals 19.3 cents.

As the table shows, the tariff has crippled the import trade. As to the exports, they are on

the increase, although the growth has been rather slow, owing partly to retaliatory restrictions imposed upon French commerce by other countries and partly to the industrial condition of France. The dependence of France upon foreign countries for her supply of coal and raw material is shown by the fact that these constitute nearly 65 per cent. of the total imports, while manufactured products make up only 18 per cent. As explained above under *Manufactures*, because of the different nature of the products, France does not compete with Great Britain, the United States, and Germany in the world's trade, where the demand is largely for cheap machine-made goods. As France sells a large proportion of expensive goods, and buys great quantities of cheap, bulky raw materials, vessels in the French trade often find it difficult to get full return cargoes from French ports.

The chief articles of import in the order of their importance are: wool, coal and coke, raw cotton, raw silk, oil-seeds, wool and timber, wine, cereals, etc.; the chief articles of export are textiles (silk, woolen, and cotton, the silk leading), wine, raw wool and yarn, linen, clothing, raw silk and yarn, leather and leather goods, skins and furs, metal goods and tools, chemical products, etc. Manufactured products constitute more than one-half of the total exports, while raw materials constitute about one-fourth. The principal countries to which France sends products are: The United Kingdom, nearly 30 per cent. of the total; Belgium, about 14 per cent.; Germany, 11 per cent.; Algeria, 6 per cent.; United States, 6 per cent. The United Kingdom ranks first also among the countries on which France draws for imports, about 14 per cent. of the total; next come the United States with a little less than 11 per cent., Germany with 9 per cent., Belgium with less than 9 per cent., followed by Argentina and Russia.

The course of trade between the United States and France in the last quarter of a century may be traced in the following table:

YEAR	Imports into the U. S. from France	Exports from the U. S. to France
1875.....	\$36,708,600	\$51,029,200
1891.....	76,688,793	60,693,190
1893.....	76,076,215	46,619,138
1896.....	61,580,509	45,149,137
1897.....	67,530,231	57,594,541
1899.....	62,146,056	60,596,899
1900.....	73,012,085	83,335,097

SHIPPING AND NAVIGATION. The French merchant marine employs more than 80,000 persons. In 1899 it consisted of 1227 steamers, of 507,120 tons capacity, and 14,262 sailing vessels of 450,636 tons, as against 1066 steamers of 492,684 tons and 14,128 sailing vessels of 440,051 tons in 1889, and 599 steamers of 277,759 tons and 14,406 sailing vessels of 641,539 tons in 1879. More than 100,000 vessels, with an aggregate capacity of 25,000,000 tons, enter the French ports annually; about four-fifths of these are French, but their tonnage barely amounts to one-half of the total. Marseilles and Havre are far in advance of other French ports both in tonnage and the value of their shipping; the other leading ports are Dunkirk, Bordeaux, Rouen, Boulogne, Saint-Nazaire, Cette, Calais, and Dieppe. A Gov-

ernment subsidy of \$5,000,000 is granted annually to French shipping interests.

France is covered with a network of navigable canals, which afford a splendid means of inland water communication. The total length of the canals is about 1242 miles.

WEIGHTS, MEASURES, AND MONEY. The metric system is the only one used throughout the country and its dependencies. There is a double standard of money, the silver being given an arbitrary value in proportion of 15½ to 1 of gold. However, there is no free and unlimited coinage of silver. By the agreement of the Latin Union, which embraces besides France the countries of Belgium, Italy, Switzerland, and Greece, the coinage of silver in each of these countries is limited. For France in 1897 the amount was 394,000,000 francs. The unit of money is the franc, equal to 19.3 cents, United States gold money. The franc has 100 centimes. The coins in use are the 10 and 20 franc gold coins; the silver coins of 1, 2, and 5 francs and of 20 and 50 centimes; and the bronze 5 and 10 centime coins.

BANKING. The French banking system has in many respects served as a model for other nations. Of late years banking and financing operations generally have acquired a greater relative importance in the economic activity of the country than before, since through that channel the surplus capital of French citizens is directed into productive fields in foreign countries. With the exception perhaps of England, France holds the leading position in the world for the amount of foreign investments. There are two distinct classes of financial institutions to be considered here: (1) The Bank of France, which stands by itself; and (2) other banking institutions. The *Banque de France* is a private institution, managed under strict Government control, owing to the important Government functions intrusted to it. This control is exercised not only by general legislative provisions, such as govern all other banks, but also directly through the governors and under-governors of the bank, who are appointed by the Government. The governor can exert a veto power over the actions of the bank by refusing to sign the decisions of the General Council, which represents the stockholders. In addition to its general banking function, such as receiving and lending money and keeping accounts with private individuals, the bank conducts all the money operations of the public Treasury, and has the sole power of issuing paper money. It was founded in 1800, and passed through many changes, following the stormy events of the nineteenth century. Its present form of organization and basis of operation date from the charter of 1857, renewed in 1897, and expiring in 1920. The maximum issue of paper money is limited to 5,000,000,000 francs (\$1,000,000,000). The State regulates, through the veto power of the governor, the ratio of metallic reserve to the notes in circulation. In return for the privilege of the exclusive power of note issue and of being the depository of all the public funds, the bank performs gratis all the fiscal services in connection with the keeping, transferring, and disbursing moneys on behalf of the Treasury. In addition to that it keeps open to the State at all times a credit of 180,000,000 francs (\$36,000,000), free of interest or any

other charges. In addition to all taxes to which other banks are subject, it pays a stamp tax on the note circulation. Its capital stock is 182,500,000 francs (or \$38,500,000), and at the close of the century its principal resources and liabilities were as follows: Metallic reserve, \$608,000,000 (advances for public works, about \$100,000,000); loan to the State, \$36,000,000 (securities and real estate, \$40,000,000; note issue \$800,000,000); State funds on deposit, \$68,000,000; individual deposits, \$105,000,000.

The other principal banking institutions are the Crédit Foncier, capital stock, \$34,000,000; Crédit Lyonnais, \$20,000,000; Banque de Paris et de Pays-Bas, \$12,500,000; Société Générale, \$12,000,000; Société Financière Lyonnaise, \$10,000,000; and a number of banks with a capital of less than \$10,000,000. The Paris Clearing House (*La Chambre de Compensation des Banquiers*), unlike the New York or London houses, plays an insignificant rôle. It was founded in 1872 after the London model, and although much had been expected of it, has not proved a success, owing to the reluctance of the French people to use checks. The use of checks is limited to very large transactions, and even in those cases is not always the rule. Savings banks thrive and flourish in France in great numbers. The first savings bank was established in Paris in 1818; in 1840 there were 430 such institutions, with deposits exceeding \$38,000,000; at the close of the century the private savings banks numbered 547 (with 1244 branch offices), the deposits exceeding the sum of \$680,000,000, credited to nearly 7,000,000 depositors. In addition to that 3,564,464 depositors had at the end of 1900 over \$200,000,000 in the Government postal savings banks. The latter were founded in 1881.

FINANCES. The characteristic features of French finances are: the largest public debt of any nation in the world, both absolutely and relatively; great and rapidly growing expenditures; and heavy taxation, which nevertheless frequently leaves a large deficit, leading to fresh borrowings.

REVENUES. The revenues of the Republic are derived from two sources, taxation and State properties and monopolies. The financial system resembles more that of the United States, differing greatly from those of Great Britain and Germany in the great preponderance of indirect over direct taxes, and in the absence of an income tax. Only about one-fourth of the revenue derived from taxation comes from direct taxes, and three-fourths from indirect. In Great Britain the proportion of direct taxes to the total tax revenue is about 40 per cent., while in Prussia it is as high as 71 per cent. The revenue derived in France from all kinds of taxes constitutes about 80 per cent. of the total, the remaining one-fifth being the income from Government properties and monopolies. The more important of the direct taxes are those on real estate and buildings, taxes on property in mortmain, on royalties from mines, trade licenses, and such objects of personal use as carriages, horses, bicycles, etc. Among the indirect taxes the most important are the registration tax, contributing more than one-fourth of the total revenue from indirect taxes; customs duties, yielding more than a fifth; the tax on sugar, about one-tenth; the stamp duty, with about one-eighth of the total indirect revenue; and a large number of excise duties on various

articles of consumption, such as liquors and wines, salt, candles, vinegar, the tax on railway tickets, etc. Bearing in mind that the incomes from a number of the State monopolies are practically indirect taxes, as e.g. in the case of tobacco and matches, it becomes apparent that the French consumer is heavily taxed on nearly everything he eats, drinks, wears, and enjoys; since the department and commune taxes cover nearly everything that the national Government leaves out, from doors, windows, and dogs, to every article of food that gets to the consumer from the country. The most important revenue from Government monopolies, in addition to those mentioned, are those derived from State railways, the operation of the mint, public domain, and forests.

EXPENDITURE. The chief item of expenditure is the service of the public debt, \$250,000,000, which absorbs considerably more than one-third of the total revenue of the Government. The next largest item is for the War Department, over \$140,000,000, or nearly one-fifth of the total; the Marine follows next, with an expenditure one-half as large; after which come the departments of Public Works, Finance, Public Instruction, Posts and Telegraphs, Colonies, etc.

The total revenue of France increased from 2,705,000,000 francs in 1875 to 3,428,000,000 in 1895, and 3,554,000,000 in 1901, the expenditures for the same years being respectively 2,980,000,000 francs, 3,510,000,000 francs, and 3,554,000,000 francs.

PUBLIC DEBT. The public debt is the natural result of continued deficits in the national budget, and dates from the fifteenth century. In 1901 it exceeded \$6,000,000,000, as compared with less than \$3,500,000,000 for Great Britain, \$3,250,000,000 for Russia, \$2,500,000,000 for Italy, \$1,327,000,000 for the United States, \$1,500,000,000 for Prussia. The indebtedness per capita, more than \$150 in France, is far beyond that of any other country. The following table shows the growth of the French national debt and the annual interest charge it involved in the course of the nineteenth century:

YEAR	Principal, mill. of francs	Interest, mill. of francs
1800.....	714	36
1815.....	1,272	64
1830.....	4,426	199
1848.....	5,913	244
1852.....	5,516	239
1871.....	12,454	386
1889.....	21,251	739
1899.....	29,948	1,266
1901.....	30,097	1,243

COLONIES. Considered from an economic point of view, the French colonial system has gone through four stages since its inception in the sixteenth century. Previous to the Revolution the colonies were administered with a view to the greatest possible profit to the ruling country. In 1825 a change of policy was inaugurated tending to secure to the colonists a large measure of self-government. This condition lasted until 1841, when many of the liberties previously granted were revoked, and a stricter financial control by the Government introduced. In 1854, however, the colonists acquired considerable independence in fiscal matters. While the home Gov-

ernment reserves control in some matters, it makes itself responsible for the expenses involved, the most important of which are the support of the army and navy, the salaries of the various Government officials, and the maintenance of prisons. The right of the colonies to impose their own tariffs was withdrawn in 1892. That the French colonies have not proved a paying investment may be seen from the following figures: in 1900 the expenses for the colonies amounted to nearly 90,000,000 francs, Algiers and Tunis excepted. In addition the Government paid out 23,500,000 francs in ship subsidies, making a total of about 115,000,000 francs, against about 8,000,000 francs of colonial receipts. The French taxpayer is thus made to contribute more than 100,000,000 francs annually for the maintenance of French control over the dependencies.

As far as the budgets of the colonies themselves are concerned, the colonies are allowed free play in the method of raising their revenue, except the right of fixing the tariff duties; but in the matter of expenses there are certain items, called obligatory expenses, for which each colony must make provision in its budget. The obligatory expenses include, among others, the payment of the debt, the maintenance of the Government buildings, a part of the maintenance and salaries for public instruction, police, insane, and poor children. In a recent work on the French colonial system Professor Seligman thus sums up the fiscal policy of France toward her colonies: "The French Government wavers between two lines of policy. On the one hand, the movement toward local autonomy has granted the colonies substantial rights of fixing their own sources of revenue and expenditure in accordance with the dictates of local expediency. On the other hand, the movement toward centralization or so-called assimilation has taken away from the colonies the privilege of levying their own tariffs, and has imposed upon many of the dependencies a system of taxation more suitable to the interests of the mother country than to those of the colonies themselves; has declared certain of the colonial expenditures obligatory, and finally has complicated the relations between the colonies and the home Government by a series of subventions on the one hand and of contingents and contributions on the other. The most recent and enlightened colonial administrators themselves plead, not only for a simplification of the relations between the colonies and the home Government, but also for a larger share of independence and initiative on the part of the colonies themselves." As to the benefit derived by France from her colonies, the following table throws some light on the question, though it is to be noted that some of the figures which enter into the summarized item "all others" for the year 1896 were taken from earlier years:

The development of trade shown by the table also continued into more recent years, the exports into France in 1899 amounting to 461,000,000 francs, and the exports from France to the colonies for the same year 477,000,000 francs. France controls a somewhat larger portion of the commerce of its colonies than Great Britain does of the trade within the regions which constitute a part of the Imperial domain. In general, the trade of the more recently acquired possessions is carried on to a smaller extent with France than is that of the older colonies, France having about nine-tenths of the trade with Réunion, but only one-tenth or less of the large trade of Indo-China. A considerable part of the French imports into the colonies is at the expense of the mother country, and consists of supplies for the troops, equipment material for various Government institutions and undertakings, and nearly one-fifth of the entire imports from France are made up of goods coming originally from foreign countries.

POPULATION. The following table shows the population of France in 1891 and 1901 by departments, and its area in square miles:

DEPARTMENTS	Area	Population	
	English sq. miles	1891	1901
Ain.....	2,248	356,907	350,416
Aisne.....	2,866	545,493	635,583
Ailier.....	2,848	424,382	422,024
Alpes (Basses).....	2,697	124,285	115,021
Alpes (Hautes).....	2,178	115,522	109,510
Alpes-Maritimes.....	1,443	258,571	293,213
Ardèche.....	2,144	371,269	353,564
Ardennes.....	2,027	324,923	315,589
Ariège.....	1,892	227,491	210,527
Aube.....	2,326	255,548	246,163
Aude.....	2,448	317,372	313,531
Aveyron.....	3,385	400,467	382,074
Belfort (territ. de).....	235	83,670	92,304
Bouches-du-Rhône.....	2,025	630,622	734,347
Calvados.....	2,197	428,945	410,178
Cantal.....	2,229	239,601	230,511
Charente.....	2,306	360,259	350,306
Charente-Inférieure.....	2,791	456,202	452,149
Cher.....	2,819	359,276	345,543
Corrèze.....	2,272	328,151	318,422
Corse (Corsica).....	3,367	288,596	295,589
Côte-d'Or.....	3,391	376,866	361,626
Côtes-du-Nord.....	2,786	618,652	609,349
Creuse.....	2,163	284,660	277,831
Dordogne.....	3,550	478,471	452,951
Doubs.....	2,052	303,081	298,864
Drôme.....	2,532	306,419	297,321
Eure.....	2,330	349,471	334,781
Eure-et-Loir.....	2,291	284,683	275,433
Finistère.....	2,729	727,012	773,014
Gard.....	2,270	419,388	420,836
Garonne (Haute).....	2,457	472,383	448,481
Gers.....	2,428	261,064	238,448
Gironde.....	4,140	793,528	821,131
Hérault.....	2,402	461,012	489,421
Ille-et-Vilaine.....	2,697	626,875	613,567
Indre.....	2,664	292,868	288,788
Indre-et-Loire.....	2,377	337,298	335,541
Isère.....	8,178	572,145	568,693
Jura.....	1,951	273,028	261,288
Landes.....	3,604	297,842	291,586
Loir-et-Cher.....	2,478	280,392	275,538

TRADE OF FRANCE WITH ITS COLONIES. ANNUAL AVERAGE, 1887-1891.

COLONY OR PROTECTORATE	Total imports	Imports from France	Percentage from France	Total exports	Exports to France	Percentage to France
	Francs	Francs		Francs	Francs	
Tunis.....	42,032,000	22,863,000	54.4	35,914,000	20,386,000	56.8
Algeria, 1892-96.....	258,956,000	198,936,000	76.8	249,938,000	202,518,000	81.0
All others.....	211,043,000	73,756,000	34.9	199,350,000	98,517,000	49.4
Tunis, 1896.....	46,445,000	25,563,000	55.0	34,608,000	20,223,000	50.9
Algeria, 1896.....	275,799,000	217,802,000	79.0	240,471,000	196,842,000	81.9
All others, 1896.....	252,951,000	109,009,000	41.1	241,716,000	101,025,000	41.8

DEPARTMENT	Area English sq. miles	Population	
		1891	1901
Loire.....	1,852	616,227	647,633
Loire (Haute).....	1,930	316,735	314,058
Loire-Inférieure.....	2,693	645,263	664,971
Loiret.....	2,629	377,718	366,660
Lot.....	2,017	253,939	226,720
Lot-et-Garonne.....	2,078	295,360	278,740
Lozère.....	1,996	135,517	128,866
Maine-et-Loire.....	2,811	518,589	514,658
Manche.....	2,475	513,815	491,372
Marne.....	3,167	434,734	432,882
Marne (Haute).....	2,420	243,734	226,545
Mayenne.....	1,966	332,387	313,103
Meurthe-et-Moselle.....	2,036	444,150	484,722
Meuse.....	2,408	292,253	283,480
Morbihan.....	2,738	544,470	563,468
Nièvre.....	2,668	343,576	323,783
Nord.....	2,228	1,736,341	1,866,994
Oise.....	2,272	401,835	407,808
Orne.....	2,871	354,387	326,952
Pas-de-Calais.....	2,606	874,364	955,391
Puy-de-Dôme.....	3,090	564,266	544,194
Pyrénées (Basses).....	2,977	425,033	426,347
Pyrénées (Hautes).....	1,750	225,861	215,546
Pyrénées-Orientales.....	1,598	210,125	212,121
Rhône.....	1,104	806,737	843,179
Saône (Haute).....	2,074	280,856	266,605
Saône-et-Loire.....	3,330	619,523	620,360
Sarthe.....	2,410	429,737	422,699
Savoie.....	2,368	263,297	254,781
Savoie (Haute).....	1,774	268,471	263,803
Seine.....	185	3,141,595	3,669,930
Seine-Inférieure.....	2,448	839,876	853,883
Seine-et-Marne.....	2,275	356,747	358,325
Seine-et-Oise.....	2,184	628,590	707,325
Sèvres (Deux).....	2,337	354,282	342,474
Somme.....	2,443	546,495	537,848
Tarn.....	2,231	346,739	332,093
Tarn-et-Garonne.....	1,440	206,596	195,669
Var.....	2,333	288,336	326,384
Vaucluse.....	1,381	235,411	236,949
Vendée.....	2,690	442,355	441,311
Vienne.....	2,711	344,355	336,343
Vienne (Haute).....	2,119	372,878	381,753
Voies.....	2,303	410,196	421,104
Yonne.....	2,892	344,688	321,062
Total.....	207,060	38,343,149	38,961,945

France is exceeded by many European countries in density of population, her figure of 188 people per square mile being only about one-third of those of Belgium and England, and far below those of Italy and Germany. It is, however, nearly seven times as large as that of the United States (exclusive of Alaska) in 1900. At the beginning of the nineteenth century Russia was the only European State that exceeded France in number of inhabitants. The population continued to grow rapidly until about the middle of the nineteenth century; since then the rate of growth has been remarkably low. While France in the last half of the nineteenth century gained only 2,858,127, the population of Germany gained over 21,000,000, Great Britain nearly 14,000,000. Most of the other European countries also made large gains, France falling to fifth place among European nations. This fact has given rise to serious apprehensions on the part of French statesmen, and furnished a fruitful topic of discussion to economists and publicists among all nations. The following table shows the growth of population in France during the nineteenth century.

The decline of population between the census of 1866 and of 1872 was 1,964,173, of which 1,597,228 was due to the loss of the different territories annexed to the German Empire. The remainder was due partly to losses in the war, and partly to an absolute decrease in the population

in 73 departments. Between 1881 and 1886 there was a loss of population in over one-third of the departments. From 1886 to 1891 the decline of

FRANCE DURING THE NINETEENTH CENTURY

YEAR OF CENSUS		Number of Population
1801.....	[26,930,756]	27,349,003
1821.....	[29,871,176]	30,461,875
1841.....	[33,400,864]	34,217,719
1861.....	[35,844,902]	37,382,225
1866.....	[36,495,489]	38,067,094
1872.....		36,102,921
1881.....		37,672,048
1891.....		38,342,948
1901.....		38,961,945

(The figures in brackets denote the population of that part of the country which constitutes the present territory of France.)

population spread over a wider area, so that the census of 1891 recorded 55 departments with a decrease in population, and only 32 with an increase. Between 1891 and 1901 there was a further decline in 62 departments, against an increase in only 25. Although the aggregate increase has been invariably greater than the loss, leaving a small gain for the country as a whole, yet the percentage of increase per decade did not hold its own during the last thirty years of the nineteenth century, and the area of declining population has been continually enlarging. The chief cause for the unsatisfactory state of the population is found in the steadily declining birth-rate. The latter is lower than in any European country, and was as follows in the last three decades of the nineteenth century: Births per 1000 living: 1871, 22.6; 1875, 26.0; 1880, 24.2; 1890, 21.8; 1900, 22.4.

Of 10,845,247 families in France recorded by the census of 1896, 6,826,850, or 63 per cent., had from none to two children; in the case of 2 per cent. of the families the number of children was unknown, and 35 per cent. had three or more children. The two largest groups were those with one and two children, constituting 24.6 and 22 per cent. of the total respectively. On the other hand, the death-rate in France is among the lowest of civilized nations. In the decade of 1861-70 the annual death-rate per 1000 living persons was 23.6; in 1871-80, 23.7; 1881-85, 22.2; 1890, 22.8; 1898, 21.2. In spite of the low death-rate, there was an excess of 25,988 deaths over births in 1900. One of the chief causes of the decline of population in several departments is the concentration of population in large cities. The urban population is rapidly gaining at the expense of the rural. The change in proportion of the two was as follows in the last half of the nineteenth century:

	Population	
	Urban, per cent.	Rural, per cent.
1846.....	24.4	75.6
1851.....	25.5	74.5
1861.....	28.9	71.1
1872.....	31.1	68.9
1881.....	34.8	65.2
1891.....	37.4	62.6
1896.....	39.1	60.9

Thus we find the urban population increased in fifty years from one-fourth of the total to nearly 40 per cent., the rural dropping from

three-fourths of the total to about three-fifths. In 1896 there were 12 cities with a population each of more than 100,000; in 1901 there were 15 such cities, the inhabitants having increased from 4,876,867 in 1896 to 5,377,486 in 1901, or 10 per cent. The following are the fifteen largest cities of France, and their population in 1851 and in 1901:

	1851	1901
Paris.....	1,053,262	2,714,068
Marseilles.....	185,062	491,161
Lyon.....	156,169	459,009
Bordeaux.....	123,935	256,638
Lille.....	68,463	210,696
Toulouse.....	85,554	149,841
Saint-Etienne.....	53,741	146,559
Roubaix.....	31,038	142,366
Nantes.....	91,308	132,990
Havre.....	26,410	130,196
Bouen.....	91,512	116,316
Reims.....	43,643	108,385
Nice.....	46,683	105,100
Nancy.....	40,289	102,559
Toulon.....	45,510	101,602

The movement of emigration and naturalization is too small to have any very appreciable effect upon the population of the country. The immigration exceeds the emigration, the total number of foreign-born persons in France in 1896 being 1,051,907, of whom the greater number came from Belgium and Italy. According to employment, one-fifth of the people are returned as employers, a somewhat larger proportion as workmen and clerks, less than 5 per cent. as domestic servants, and about one-half of the people as members of families dependent on those enumerated in the above groups. By occupation the people (including those depending upon the head of the family) were distributed as follows, according to the census of 1891: agriculture, 17,435,888; industry, 9,432,560; transportation, 1,199,333; commerce, 3,961,496; public employment, 1,415,235; professions, 1,114,873; private fortune, 2,169,750; unclassified, 1,304,250.

ETHNOLOGY. The perspective of history reconstructed by ethnologists is more continuous in France than in any other country. In blood the French combine many races, prehistoric Teutonic blond long-heads, Alpine or Celtic short-heads, and Mediterranean brunette long-heads. The stature of conscripts is given as 1.646 meters and the general cranial index at 83.4, ranging from 75 to 88. But anthropometric characteristics have to be studied with caution, since the tall, light-complexioned type, with blue or gray eyes, predominates in the north; the short-headed, brunette type, marked by dark eyes and low stature, prevails in the middle and south; and the Mediterranean type, brunette, dark-eyed and short, occurs in parts adjoining Italy and Spain. The southern French may be called 'Iberio-Celtic' and the northern French 'Teuto-Celtic,' the language of both being Italic. A retrospect of French ethnology includes: (1) The modern period of racial coalescence since the Crusades, embracing also nationality and speech; (2) incursions of Saracens (arrested by Charles Martel, A.D. 732), Burgundians, Franks (who gave their name to the country), and Visigoths, the last three being Teutons; (3) the Roman conquest and all that it means in racial mixtures, no less than in sovereignty and speech; (4) the earlier settlements of Belgian long-heads, Celts, or Gauls, and Aqu-

tanian and Ligurian brunettes; (5) Semitic and Pelasgian settlements, made by Phœnician and Greek colonists, of little account, however, to the ethnologist; (6) the peoples of the earliest Iron and the Bronze Age, with a variety of skull types; (7) the Neolithic authors of menhirs and dolmens, exhibiting intermixture of brachycephals and dolichocephals; (8) the Laugerie-Chancelade or Cro-Magnon and the Neanderthal or 'Spy man,' Paleolithic dolichocephals, contemporaries of the cave bear, mammoth, and reindeer, and back of that, the rudest stone ages, when men are alleged to have lived with the mastodon and *Elephas antiquus*. France has experienced in this long stretch of time and evolution of culture the whole range of climates in which man can exist, ranging from arctic to tropical, together with their fauna and flora.

EDUCATION. Since the Franco-Prussian War the subject of education has been one of intense interest to the French people. In this respect France has probably exhibited a greater zeal than any other European country. The Republic has considered it of first importance that it should fortify itself with an enlightened citizenship. Accordingly, every grade of education has been subjected to a transformation that has been almost revolutionary. In the years 1881-82 were passed compulsory-attendance laws and laws abolishing tuition-fees. Prior to that time the educational system had been more or less dominated by clerical influence, the Catholic religion being taught, and a large number of the clergy having representation on the teaching staff. The influence of clericism was thought to be detrimental to the strengthening of republican ideals and institutions. Consequently the educational reforms assumed a religious phase, and have been more bitterly contested than in any other European country. In 1882 the teaching of religion in the schools gave way to the teaching of morals, and by a law of 1886 teaching in the public schools was limited to lay teachers, and schools in which religion was taught received no aid from the Government. The dissatisfaction on the part of some with this secularization of the schools was shown in the subsequent growth of the clerical *lycées* and colleges at the expense of the State schools of the same rank. The matter became of grave concern to the Government. In its desire to lessen the attendance at the religious schools, and thereby forestall the hostile influence which was presumably fostered by them, the Government secured the adoption of the Associations Bill, which went into effect in 1902, according to which many religious associations were obliged to dissolve their schools likewise. By a second law which made three years' preliminary study in the State school a prerequisite to securing an official State position or to entering a special school, the Government practically excluded graduates of clerical schools from admission to some of the leading professions.

The public system of education begins with the kindergarten or *écoles maternelles*, which admit children from the ages of two to six years. In addition to giving kindergarten instruction, they serve the function of infant schools where care may be given to children of the laboring classes. The establishment of these schools is optional with the communes. The attendance in 1899-1900 was: Public—chiefly lay—458,278, and pri-

vate—chiefly clerical—288,839. Next are the lower primary schools, the attendance of which is compulsory for children between the ages of six and thirteen (if not receiving instruction elsewhere), or until they have passed the examination for the completion of the course, which many of them do before the end of the compulsory time requirement. The instruction, as in the higher schools, is given to the sexes separately. In 1899-1900 the attendance at the public primary schools was more than three times that of the private primary schools, and the number of children not receiving instruction was very small. The total number of children in the primary schools in 1899-1900 was 5,530,232, of whom 1,250,562 only were in the private clerical schools. The system has resulted in greatly reducing the illiteracy of the country, as is shown from the fact that in 1880 the per cent. of illiterates among conscripts was 14.4, while in 1897 it was only 5.1.

The secondary schools include State classical colleges (*lycées*), supported by the State, and communal colleges, supported by the communes, though aided by the State, for boys, and schools of similar rank for girls. In 1900 the *lycées* for boys numbered 109, and the communal colleges 229, with a total enrollment of 85,599. In the same year the non-State clerical schools of the same rank had an enrollment of 91,825, and the lay schools enrolled 10,182 pupils. The course of instruction covers five years, the most usual age of students being 13 to 18. The establishment of the communal colleges is optional with the commune. The secondary schools award the bachelor's degree. The boys' *lycées* were formerly classical institutions, Latin and Greek occupying the principal place in the curriculum. In 1902 an elective system was introduced, making it possible to take either a modern-language course or a science course, intended to prepare for a more practical career. Also, four distinct courses are at the option of the student, but he cannot change from one course to another, or exercise any range of choice within the course selected. All courses lead to the same degree, and confer the same privileges, and a degree may now be secured without the study of Greek and with only a minimum of Latin. History, civics, and ethics receive special emphasis, and the practical point of view is emphasized in the teaching of all subjects. The girls' *lycées*, however, from their introduction about 1881 took little notice of the ancient languages, but emphasized rather the French language and literature. The convents still have the patronage of a majority of those taking secondary courses, but the number who attend the newly established *lycées* is rapidly increasing, being 11,994 in 1899. Many of the secondary schools are attended by both boarding and day students. A large number of the more intelligent students are assisted by a system of fellowships. Graduation from the secondary schools—public or private—is a prerequisite to securing the ordinary degree from the universities.

The interests of higher education are subserved by the fifteen State universities and by various governmental and private special schools. From 1803 to 1896 the universities of France were deprived of their autonomy, and were little more than degree-conferring groups of faculties. In 1896 their autonomy was reestablished. The fifteen universities are: Paris, Lyons, Toulouse,

Poitiers, Rennes, Nancy, Montpellier, Aix-Marseilles, Bordeaux, Dijon, Lille, Grenoble, Besançon, Caen, and Clermont-Ferrand. The faculties of the universities are paid by the State, but the universities are otherwise dependent upon the local community or upon private munificence. Numerous benefactors by their liberal gifts have shown an interest in the welfare of the universities. The response of local communities must naturally vary enormously, and there is therefore a great inequality in the size and prosperity of the different institutions. Those located in large and wealthy cities, like Paris or Lyons, have a great advantage over those in smaller towns. The enrollment in the University of Paris in the year 1900 was 12,193—nearly three-sevenths of the total attendance at the State universities. The French universities attract the most students of medicine and law, the number exceeding the total taking corresponding courses in German universities. The conditions upon which degrees were formerly conferred made it difficult for a foreign student to secure them, but with the new regulation introduced in 1897 degrees are more easily obtained, and there has consequently been a very large increase in the number of foreign students.

Besides the universities there are a large number of special schools, both Government and private, covering almost every phase of science and art. The movement toward a more modern technical course of instruction has permeated the school system, having even entered the classical *lycées*, and in no other country do the provisions afforded for preparing for the practical affairs of life equal those of France. Special emphasis is given to instruction in commerce, agriculture, etc. Theological instruction is amply provided through schools established for that purpose. Finally, the advancement of knowledge is sought through the organization known as the Institute of France (*q.v.*), whose five academies embrace in their scope every phase of learning.

The administration of the educational system in France is characterized by an unusual centralization and coordination. The highest educational officer is the Minister of Education, who holds a position in the Cabinet. He is actively assisted by a Superior Council of 58 members, while a second council exercises advisory powers only. The whole State system is divided into superior, secondary, and primary departments, with a director responsible to the Minister at the head of each. For the administration of education France is divided into sixteen districts called academies, and the civil departments serve as subdivisions for each of these. At the head of each *académie* is a rector, and at the head of each department an academy inspector, the latter receiving his appointment from the Minister. Subordinate to the academy inspectors are the primary inspectors—about 450 in number. The prefect of the department, assisted by a council, appoints teachers from the approved list, submitted by the inspectors. The mayor and council of the communes are responsible for school property. The State pays all expenses for teachers, administration, and inspectors of the entire educational system; the departments pay for the erection and furnishing of normal schools, and the communes pay for the erection and furnishing of the local elementary schools. The total expenditure for

public primary schools is increasing from year to year, being estimated at \$6.05 per capita enrolled in public primary schools (including infant schools) in 1881-82 and at \$9.20 in 1896-97. This estimate does not include the interest paid on moneys advanced for school buildings, which, if included, would raise the per capita expenditure for 1897 to \$11.20.

The educational system provides particularly also for the preparation of teachers. Separate normal schools for the training of teachers for the elementary grades are provided in each civil department for men and women, at which tuition, board, rooms, and books are all free. Teaching is now a profession in France. Each normal student pledges himself to teach ten years, and all candidates for schools must hold normal certificates. Besides the elementary normal schools there are a higher normal school, intended to qualify for inspectorships and other positions of high rank, and another normal school for kindergarten teachers. The supervision of the school is in charge of the primary inspector (serving under the department inspector), who is judge of the teacher's proficiency, and upon whose recommendation depends the teacher's advancement or degradation. The schools have no position corresponding to that of superintendent or principal in the American schools. After serving the requisite time teachers are allowed to retire on a pension. The system is noteworthy in that it secures a high grade of teachers for country districts, inasmuch as the salary depends upon proficiency and is paid by the State, although the commune may supplement this from local funds, as is not infrequently done.

The French educational system seems to have failed to meet the educational needs of the country in one important respect. As compared with most of the American States, the number of pupils who continue their work into the secondary schools is small. Inasmuch as the children are yet young when they finish the primary course, there is a period in their lives when they are likely to be unoccupied, and the benefits lost of the education already acquired. France has become aroused to the need of further educational provision for the adolescent and adult periods of life, and the establishment of some form of night schools has been undertaken with remarkable success. Very little, however, has been contributed by the Government for their support, their introduction and maintenance being largely in the hands of societies and organizations. These schools are sometimes in the nature of continuation schools, but they take their form from the local needs, and sometimes follow more nearly after the style of university extension work, or of the illustrated lecture. In 1897-98 those taking courses in adult schools (popular lectures not being comprehended in these) numbered 378,000 men and 105,000 women.

RELIGION. All religions in France are tolerated, and since the decree of Napoleon I. in 1802 Catholic, Protestant, and Jew receive State aid, Mohammedans being similarly favored in Algeria. The amount of the State grants varies but little from year to year. the appropriation in 1902 being: for Roman Catholic worship, 40,990,923 francs; Protestant worship, 1,495,100; and Jewish worship, 206,530. Administration and other costs amounted to 291,000 francs.

No religious census of France has been taken

since 1872, and exact estimates of the numerical strength of the different religious faiths are misleading. It may be said, however, that about three-fourths of the people are, at least nominally, Roman Catholics. The indifference to the Church manifested by a large number of members, and the radical opposition to the Church and to all religions by non-members, and the resulting policy in regard to the Church, has brought upon France the charge of being an agnostic nation. The source of the opposition is generally considered to be of an historical and political nature. The relation of the Church with regard to the despised social order prevailing in pre-Revolution days is still charged against it. It is suspected of being out of harmony with republican ideals and institutions, and of being intent upon grasping power to use against the present form of government. This charge is directed particularly against the religious associations. The intimate relations of these organizations with the Vatican presumably make their interests clash with those of the Republic. During the French Revolution religious orders were disbanded and the enormous wealth they had accumulated was largely confiscated. But they have since reestablished themselves, and have become three times as numerous as before the Revolution, there being, in 1901, 3216 establishments for men that were recognized by the Government, comprising a membership of 30,136; while there were 2870 recognized and 13,428 unrecognized establishments for women, with a total membership of 129,492. A large part of these were engaged in educational work, which was naturally one of the most potent agencies for the spread of their influence. Their wealth had likewise accumulated, and they entered extensively into various kinds of commercial enterprise, which gave them another vantage ground for the exercise of their influence. Moreover, by virtue of their standing at Rome they were supposed to have practical control over the regular clergy and the main body of the Church, whose sympathies and influence would otherwise presumably be more favorable to democracy. Opposition to the Church and the fostering of agnostic propaganda is generally supposed to centre in the Free Mason and the Socialistic elements of the population, and these factions on the one extreme and the ardent clericalists on the other are pitted against one another. In 1882 the opposition to clerical influence secured the abandonment of religious instruction in the public schools, and in 1886 the prohibition of clerical members from holding positions in them. These measures were followed in 1901 by very radical laws, directed particularly against the religious associations. According to these, all associations must be authorized by the Government, and those found to violate the law, or to be detrimental to the republican form of government, or to good morals and order, were to be dissolved. Parliamentary consent is necessary to the formation of associations which have foreign directors or a foreign domicile. It was declared that the public welfare should be considered, both in an abdication by the individual of his rights as such, and in a renunciation of the exercise of the natural faculties, such as occurs, for instance, with the taking of the vows of celibacy. It was especially intended that the law should operate against the continuance of the association schools, and it was further provided that members of dissolved

Orders could not teach until their membership with the Order was terminated.

The opposition to Catholicism has not resulted in a strengthening of Protestantism, nor, though there are occasional defections on the part of the clergy, is there any general movement within the Church to break with Rome, such as exists in Austria. The number of Protestants is actually diminishing, and it is thought to have lost considerably over one-third of its membership since 1835 (making allowance for the dismemberment of Alsace-Lorraine), the number at present being about 600,000. At the same time the influence of Protestantism under the present Government is probably out of all proportion to its numerical strength, as is evidenced by the large number of its representatives who are leading governmental officials. The Protestants are most numerous in the south of France, particularly in the Department of Gard. There are two branches of the Protestant Church, the Calvinistic and the Lutheran, the former containing the large majority of the Protestant population. The Jews are supposed to be decreasing, and number less than 100,000, the large cities, Paris, Lyons, and Bordeaux, being the chief centres. (See HUGUENOTS.)

CHARITIES. Thrift is a national characteristic of the French people, and pauperism has never been prominent in France. The policy adopted in dealing with the needy has been characterized by the emphasis which has been placed upon voluntary relief, and upon outdoor and local, as against institutional relief. The State does not recognize that the individual has a legal right to demand alms, and does not place the local communities under compulsion to provide means of charity relief. Direct parochial taxes for charitable purposes have not been levied since the time of the French Revolution. The scheme for charity administration as drawn up under Napoleon I. made possible the formation of a *bureau de bienfaisance* in each commune, but it was not made compulsory and has been impracticable in the smaller and poorer communes. There is therefore no communal machinery of relief for the poor in a large part of rural France. These bureaux (consisting of the mayor of the commune and six commissioners) solicit and receive contributions from private sources, and the bulk of their endowment is secured in this way. Special grants are sometimes made by the communes, and a tax is levied upon theatres, balls, concerts, and other amusements. The bureaux give outdoor relief, the amount of which is likely to be arbitrarily adjusted to the funds at command rather than the existing needs, and may be either meagre or excessive. Many of the communes are provided with hospitals, and sometimes a number of communes jointly use the same hospital. Coöperation between the State systems of charity and private charity is minimized, inasmuch as private charity is mainly religious, while the attitude of the State is essentially anti-religious.

There are, however, two classes of the needy that have been very adequately provided for, namely, the dangerously insane and children. The necessity for caring for the first of these is evident. Asylums for that class are established in the different departments (although there are also State asylums), and their support is divided between the departments and the

communes. The State places itself under special obligation for providing for children by virtue of its law which prevents the attempt to fix the responsibility for fatherhood. Three different classes of children are distinguished in the system of child-relief. The children of the first class are under two years old—*enfants du premier âge*—and are placed in the care of a nurse under the most careful surveillance of the Government authorities, the expenses incurred being divided equally between the State and the department. The second group, or *enfants assistés*, includes foundlings, abandoned children, destitute orphans, and *enfants secourus*, not exceeding twelve years of age at the time when the Government assumes control over them, although remaining under public control until they reach the age of twenty-one. These children are usually placed in peasant homes until they are thirteen or fourteen years old, when they are made apprentices—preferably in the same family—under guardianship, the guardians being subject in turn to the oversight of the State-paid department inspectors. The other expenses incurred in providing for this group are shared between the State, the department, and the commune. A large number of children requiring public attention but not coming under either of the above classes fall in a third group, *enfants moralement abandonnés*, who are generally apprenticed or placed in an industrial school.

A departmental system of medical aid was established in 1893, and, according to the statistical returns, by the end of the century about half of the population of France availed themselves of the medical aid thus supplied. The Government further aids the masses through the establishment of savings banks, and through the State monopoly of pawnshops, and particularly, since 1897, by an annual contribution to old-age pensions. The State exercises a direction and surveillance over the administration of the charities system, this function being in charge of a department under the Minister of the Interior. The influence of the central department operates largely through the prefects, who are responsible to the Minister, and who have a voice in the appointments of boards of managers of hospitals, asylums, and *bureaux de bienfaisance*.

GOVERNMENT. The present government of the French Republic is based on a series of three so-called 'constitutional' laws, adopted by the National Assembly in 1875, and since that date amended and supplemented at different times by ordinary statutes, called 'organic' laws. The French Constitution, therefore, differs from most written constitutions in not being comprised in a single document. Another peculiarity is its brevity and conciseness. Only the barest outlines of the government—the mere framework—are provided for in the fundamental law, all the details of organization being left to the determination of ordinary statute. The numerous limitations upon the power of the Government in behalf of individual liberty, which constitute so notable a feature of the Constitution of the United States, are wholly lacking in the French Constitution. It is, in short, a constitution of government and not of liberty. That part of the Constitution which is contained in the so-called organic laws is subject to amendment by the ordinary processes of legislation, while the pro-

visions of the constitutional laws may be changed only by action of the Chambers united in National Assembly, and by absolute majority of all the members.

The form of government which has prevailed in France since 1875 may be described briefly as a centralized parliamentary republic. The Constitution provides for a bicameral Parliament, consisting of a Chamber of Deputies and a Senate, with substantial equality of powers in legislation, the only exception being the exclusive power which belongs to the Chamber of Deputies to originate revenue measures. As to the composition of the Chamber and the source from which it proceeds, the constitutional laws contain no provisions except the single one that its members shall be chosen by universal suffrage. It was provided by ordinary statute that universal suffrage should be considered as the suffrage of all male citizens twenty-one years of age, who have resided for a period of six months previous to the election in the commune in which they offer to vote. Certain classes who have lost their civil and political rights, or who are in active military or naval service, or who have been judicially convicted of certain crimes, as well as those who have been declared bankrupt, are disqualified. It has also been determined by ordinary statute that the Chamber should consist of Deputies apportioned according to population, on the basis of one Deputy to every 70,000 inhabitants. At the present time there are 584 Deputies, distributed among 97 administrative departments, into which France and the colonies are divided. The departments are subdivided into *arrondissements*, containing approximately equal populations, and one Deputy is assigned to each. Where an *arrondissement* contains a population exceeding 100,000, it is divided into two or more constituencies. The Deputies are chosen, not according to general ticket (*scrutin de liste*), as Presidential electors are chosen in the United States, but by district (*scrutin d'arrondissement*), according to the American method of choosing Representatives. Both methods have been tried, chiefly with a view to obtaining party advantage; but since 1889 the single-district method has been in use, and seems likely to continue as a permanent institution. The constitutional laws make no provision concerning the qualifications of Deputies. The completion of the twenty-fifth year, however, has been prescribed by statute as a necessary qualification. To this is added a number of disqualifications, such as the holding of certain other incompatible offices at the same time. The term of service is fixed at four years, unless the Chamber is dissolved earlier, and the members are privileged from arrest during the session, unless taken in the act of committing a crime. They are, moreover, exempt from legal responsibility for opinions expressed during the discharge of their legislative duties.

The constitutional laws now in force make no provision concerning the composition and organization of the Senate, and but scant provision in reference to its powers. A statute of 1884, which superseded the constitutional law on the subject, provides that it shall consist of 300 members, chosen by electoral colleges in the various departments. In each department this body consists: (1) Of the Deputies chosen in the par-

ticular department; (2) the members of the General Council of the department; (3) the members of the councils of the several *arrondissements* in the department; and (4) delegates chosen by the municipal councils of all the communes of the department. The Senators are apportioned among the several departments according to population, the number in each varying from one to ten. In contrast to the method of choosing Deputies, the Senators from a given department are selected on a general ticket (*scrutin de liste*), each elector voting for the whole list. By statute the qualifications of Senators are fixed at citizenship and the completion of the fortieth year. There are also certain disqualifications similar to those in the case of Deputies. The tenure of Senators is fixed at nine years, and, to secure partial renewal, it is provided that the terms of one-third of them shall expire every three years. Originally there were 75 life Senators, chosen by the National Assembly, their successors being selected by the Senate. By an amendment to the Constitution, adopted in 1884, however, this remnant of monarchy was abolished, and it was provided that thereafter vacancies occurring among life Senators should be filled according to the manner prescribed for the choice of nine-year Senators. Senators have the same rights and privileges as Deputies, and receive the same salary, which at present is 9000 francs a year. In addition to its legislative duties, the Senate has two peculiar functions: First, its consent is necessary for a dissolution of the Chamber of Deputies—a restraint upon the possible arbitrary conduct of the President; and, second, it acts as a high court for the trial of persons accused of attempts upon the safety of the State.

The Constitution requires the two Chambers to assemble annually in January, and to remain in session at least five months. The President may convene them at an earlier date, and he is bound to do so if the demand is made by a majority of the members composing each Chamber. They may also be adjourned by the President; but the duration of the adjournment cannot exceed one month, and is not permitted to occur more than twice in a session. Bills may be presented in either Chamber by private members or Ministers, except that revenue measures must originate in the Chamber of Deputies. Whether the Senate has the right to amend bills of this character is a disputed question. The Chamber of Deputies denies the right of the Senate to increase its revenue proposals, but the Senate has asserted its right successfully on a number of occasions. All bills must be referred to a special committee for consideration before being taken up in either House. A measure duly passed by both Chambers is sent to the President for his approval. He has neither an absolute nor a qualified veto, although he may demand reconsideration of the measure, and a constitutional obligation rests upon the Chambers to consider his objections; but if they repass the measure by the regular majority it becomes law in spite of the President's objections.

Although the parliamentary system of government prevails in France and monarchical traditions are strong, the chief executive is elected, not, however, by popular vote, but by a body composed of the members of the two Chambers

of the Legislature. They are required to meet for this purpose at Versailles at least one month before the legal expiration of the Presidential term, and in case of the death or resignation of the President they are commanded to assemble immediately and form themselves into an electoral college. A majority of the whole number of members is necessary to elect. The only qualification prescribed by the Constitution is that the President shall not be a member of any family that has reigned in France. His term is fixed at seven years, and it is expressly declared that he is reëligible. The President's position is one of irresponsibility except for the offense of high treason, and even then he is subject to arraignment by the Chamber of Deputies only, and to trial by the Senate only.

The powers and duties of the President are manifold. In the domain of foreign relations his powers include the negotiation of treaties, with the limitation, however, that treaties of peace and of commerce, treaties which add to the financial burdens of the State or which subtract from its territory, or which affect the personal or property relations of Frenchmen in foreign countries, must be approved by the Chambers; the appointment and reception of ambassadors and ministers; and perhaps the power to wage defensive war and, with the assent of the Chambers, to wage offensive war. Besides the powers of the President in legislation, to which reference has already been made, he may prorogue the Parliament, may initiate legislative measures, and it is his duty to promulgate the laws. In the field of administration he has a wide power of appointment and of supervision, and an extensive ordinance power. The Constitution expressly confers upon him the appointment of all officers, and by implication the dismissal of most of them. He has the power of issuing the necessary ordinances for the execution of the laws where the Legislature has not made provision for the same. He has also the power in many cases to issue supplementary ordinances for the purpose of filling out the details of legislative acts, for it must be remembered that it is the practice in France to embody only the main facts in the statutes, leaving minor details to be supplied by executive ordinance. The military powers of the President include the disposition of the army and navy, while in the domain of judicial administration he is vested with the power to grant pardons, commute penalties, and issue reprieves.

In exercising the above-mentioned powers the President acts through Ministers who are collectively responsible to the Chambers for the general policy of the administration, and individually responsible for their own personal acts. The Constitution expressly declares that every official act of the President to be valid must be countersigned by a Minister, thus insuring the irresponsibility of the President. Theoretically, at least, he is in the position of the British sovereign, and can do no wrong. In theory the Ministers are appointed by the President and serve during his pleasure. In practice they are appointed by the leader of the majority in the Chamber of Deputies, and they resign when defeated. Legally their responsibility is to both Chambers, but as a matter of fact it is only to the Chamber of Deputies, and an adverse vote in

the Senate no longer leads to the resignation of the Ministry. Usually the Ministers are selected from the members of Parliament, but whether they are or not, they are entitled to seats in the Chambers, and must be heard whenever they wish to speak. Their duties are of a twofold character. In the first place, they are the heads of the several administrative departments of the Government, and secondly they are the leaders of the parliamentary majority in the Legislature and the representatives of the Government whose measures they seek to have adopted, and whose general policy they defend against attack. The number of Ministries or departments is fixed by decree of the President, and varies from time to time. At present there are eleven: those of the Interior; of Justice; of Foreign Affairs; of War; of Marine; of Public Instruction; of Public Works; of the Colonies; of Commerce; of Agriculture; and of Finance. Besides acting as heads of the departments they are also members of the Council of State, the highest administrative court in the Republic. Their responsibility is both political and criminal. Their political responsibility is collective in matters of general policy, and single in cases of individual activity, and is secured by liability to dismissal from office. Their responsibility for crimes committed in the exercise of their duties is to the Legislature, the Chamber of Deputies acting as the accuser and the Senate as the trial court. For crimes committed in their private capacity they are responsible to the ordinary judicial courts. The Ministers are held to their political responsibility through several forms of interrogation in the Chambers. These are the 'direct question,' which any member may ask of a Minister after previously securing his consent, the purpose being to gain information concerning the policy of the Government; and the 'interpellation,' which is a formal challenge of the Government's policy, and is usually followed by a vote of confidence or of disapproval. Unlike the direct question, the interpellation is always in order, and the consent of the Minister questioned or of the Cabinet is not necessary.

Finally, it should be said that French Ministries are short-lived, chiefly on account of the numerous party divisions and factional groups in France. As yet no Ministry of the Republic has continued in power for a period exceeding three years.

The judicial system of France is a purely statutory creation, the only constitutional provision on the subject being that which relates to the constitution of the Senate as an extraordinary court for certain cases. By statute a hierarchical system of judicial and administrative courts has been created. Of the judicial courts, the highest is the Court of Cassation at Paris, which is composed of a First President, three presidents of sections, and forty-five judges or councilors. Next below this tribunal are the twenty-six Courts of Appeal, each composed of a president and four councilors, and with territorial jurisdiction over several departments. They hear cases from the Courts of First Instance in the arrondissements, while these in turn hear appeals from decisions of the justices of the peace in the cantons. These latter try civil cases and act as police judges for the disposal of petty offenses. For the trial of criminal cases involv-

ing penalties up to imprisonment for five years, police correctional courts without juries are provided. More serious crimes are tried by courts of assizes, constituted periodically in each department, and consisting of a jury of twelve men who are the sole judges of the question of guilt, and who fix the punishment. The ordinary civil courts are without juries, the judges alone deciding the question of fact, as well as of law. The judges are appointed by the President of the Republic, and their tenure, except in the case of the justices of the peace, is good behavior. They can be removed only by the Court of Cassation.

The administrative courts are an outgrowth of the Napoleonic legislation, and are intended to relieve the judicial courts from the decision of administrative questions. It is the French theory that such questions should be determined by men who have a practical knowledge of administrative law, rather than by judges who have been trained only in the private law. The administrative courts are tribunals of enumerated jurisdiction, but the general rule is that they take cognizance of all administrative acts. The judges of the administrative courts are all appointed by the President, but, unlike the members of the judicial courts, are removable at his pleasure. They are trained in the work of administration and receive large salaries. The most important administrative court in France, as well as the highest, is the Council of State. It is composed of 116 members (councillors, commissioners, and auditors), and is divided into four administrative sections and one judicial section. It has both original and appellate jurisdiction in a variety of administrative matters. Next to the Council of State in importance are the prefectural councils of the departments. There is one in each department, and it is composed of several councillors, together with the prefect. It has a large contentious jurisdiction in administrative matters, and appeals from its decisions lie to the Council of State. Besides these courts there are a number of special administrative tribunals of minor importance. To determine whether the administrative or the judicial courts shall have jurisdiction in a given case, where the question of the forum is in dispute, a Tribunal of Conflicts is provided. It belongs to the prefect to raise the question of competence, whereupon the matter is sent to the Conflict Court for determination.

Local government in France differs from the English and American systems in several important respects. In the first place, the organs of local government in France are not generally authorities of enumerated powers, but are vested with the management and control of all local affairs without any attempt at specification. Secondly, to prevent the local organs from misusing such wide powers, the method of central administrative control has been introduced. This is the most important characteristic of French local government, and, like the system of administrative courts, was inherited from the Napoleonic era. While it secures uniformity and symmetry, it destroys the element of local self-government. The activities of the local organs are twofold. In the first place, they are made use of by the central Government for the administration of matters of central concern. In the

second place, they attend to matters of purely local interest largely according to their own ideas and through officers of their own choosing. For the purposes of administration France is divided into eighty-seven departments, in each of which is a prefect, appointed and removed at the pleasure of the President. He is both a central and a local officer. As agent of the central Government he supervises the execution of the national laws, and decrees and instructions of the Ministers, particularly those of the Minister of the Interior, of whom he is a subordinate; issues police ordinances, appoints many officials and directs them in their duties, and makes reports to the Government on matters in which it is concerned. In this capacity he is assisted by a prefectural council, appointed and dismissed by the President—a body whose advice he is often bound to ask, but never obliged to follow. As a local officer he appoints all the officials in the service of the department, has charge of departmental finances and public improvements, and executes the resolutions of the General Council. This latter body is the legislative assembly of the department, and is chosen by universal suffrage for a term of six years, one-half the members retiring every third year. It holds regular sessions twice a year, and the subjects to which its legislative power extends include departmental property, finances, highways, public works, and poor relief. Its resolutions in many cases may be annulled by the central Government, and in some cases they must be approved by the President of the Republic to be valid. If, for example, in the preparation of the budget, the council should neglect or refuse to make the necessary appropriations, or levy the taxes required, the President is empowered to order it done.

The next local subdivision below the department is the *arrondissement*. This is an administrative and election district rather than a public corporation for purposes of local government. Below the *arrondissement* is the *canton*—an election and judicial district of little importance. The lowest administrative unit is the *commune*—a local area of historical growth rather than an artificial creation. It may be either urban or rural, and varies in size from a few acres to several square miles. The two communal organs which correspond to the prefect and the general council of the department are the mayor and the municipal council. The mayor, like the prefect, is both a central and a local officer, and since 1884 has been elected by the municipal council. As a central officer, he is subject to the control and direction of the prefect. He serves during the term of the council by which he is elected, but may be suspended temporarily by the prefect or Minister of the Interior, and removed by the President. As central officer he keeps a register of vital statistics, solemnizes marriages, has charge of the police, and issues ordinances affecting the public health, order, and safety. As local officer he appoints most of the communal officers, administers the local property, draws up the budget, and supervises the execution of the resolutions of the municipal council. The municipal council is the deliberative organ of the commune, and is elected by universal suffrage for a term of four years. It holds four regular sessions annually, may be suspended temporarily by the prefect, and dissolved by the

President of the Republic. Its duties extend chiefly to purely local affairs, but the approval of the central Administration is necessary for the validity of its resolutions on many subjects, such as those relating to the erection of public works, incurring loans, levying taxes, and appropriating money. Any act deemed by the central Administration to be in excess of its jurisdiction may be declared void. Excepted from this general system of municipal government are the capital, Paris, and the city of Lyons, for the government of which a special arrangement is provided.

NATIONAL DEFENSE. In view of the great emphasis placed upon keeping the national system of defense in the highest possible degree of efficiency, and the important rôle which the army plays in the national life, France has become known as a military republic. All able-bodied men are liable to military service for a term of 25 years. Three years' active service, beginning at the age of 20 years (although the individual may volunteer his services during the two preceding years), are required; but provisions are made, applying mainly to advanced students, by which under qualified conditions the period may be shortened to one year. Appointments to military offices are made by the President of the Republic, but the command of the army is vested in the department of the Ministry of War. In 1902 the total strength of the army, including the forces in Algeria and Tunis, was 589,444. There are 4,350,000 men who are liable to military duty, of whom 2,500,000 are available. A statement of other general regulations, and the treatment of the scheme and the statistics of army organization will be found under the title **ARMIES**. Staff officers are trained at a military school in Paris, the course being two years, and admission is secured by competitive examinations; infantry and cavalry officers are trained at Saint-Cyr; artillery and engineer officers at the polytechnic school situated at Fontainebleau; and in addition to these there are a large number of schools for various phases of military instruction.

The fortifications of France, being situated naturally with reference to the nature of the frontier and the relative danger of invasion, are most numerous in the north. Lille and Maubeuge are on the Belgian frontier; Toul, Verdun, Epinal, and Belfort are near the German frontier. Other fortified places in the north are Laon, La Fère, Paris, and Langres. The fortifications at Besançon, Pontarlier, Dijon, Albertville, Briançon, Nice, Grenoble, and Lyons defend the country on the east. Near the Spanish frontier are the small fortifications of Perpignan and Mont Louis, on the east, and Bayonne, on the west. The Atlantic Coast fortifications are Dunkirk, Calais, Boulogne, Havre, Cherbourg, Granville, Saint-Malo, Brest, Lorient, Saint-Martin de Ré, Ile d'Aix, Oléron, La Rochelle, Rochefort, and the Estuary of the Gironde; while the Mediterranean coast is protected at Villefranche, Antibes, Saint-Tropez, Marseilles, Toulon, Cette, and Port-Vendres.

Great attention is also given to the naval branch of the national defense, and the navy of France is generally considered to rank next to that of Great Britain. The personnel of the navy is recruited partly by voluntary enlistment, and partly by conscription. The Government maintains a list of all of the men between the ages of eighteen and fifty years who are engaged in a

seafaring life, and these men constitute a naval reserve. Particulars of the organization and strength of the navy are given in the article **NAVIES**. The colonial points used by France as a basis of supplies and operation are: Cape Saint Jacques in Cochinchina, Port Courbet in Tongking, Fort de France in Martinique, Saintes in Guadeloupe, Port Phaéton in Tahiti, Nouméa in New Caledonia, Dakar in Senegal, Libreville in Congo, and Obock on the East African coast, at the entrance to the Red Sea. The principal naval school for the training of naval officers is situated at Brest.

HISTORY.

Gallia, or Gaul, was the ancient name under which France was designated by the Romans. They knew little of the country till the time of Cæsar, who, after a series of wars covering seven years, completed its conquest in B.C. 51. At this time it was occupied by three branches of the Celtic race—the Aquitani, the Celtæ, and the Belgæ. There were also some Germanic inhabitants and a few Ligurians and Greeks, but the latter never penetrated far beyond the shores of the Mediterranean, where they planted colonies, the most important of which was Massilia (Marseilles). Under the Roman rule Gaul advanced rapidly in civilization and refinement, and was one of the most important portions of the Empire. (See **GAUL**.) With the decline of the Roman power in the fifth century it fell completely under the power of the Visigoths, Burgundians, and Franks. In A.D. 486 Clovis, a chief of the Salian Franks, by his victory over Syagrius near Soissons, put an end to the Roman dominion. Clovis embraced Christianity in 496. After his death in 511, his kingdom was divided among his sons, Theodoric, Chlodomer, Childebert, and Clothaire. His dynasty, known as the Merovingian, ended in the person of Childeric III., who was deposed, in 751, after the reality of kingly power had already passed into the hands of the mayor of the palace, Pepin of Heristal, and after him into those of Charles Martel and Pepin the Short, the latter of whom ascended the throne as the first of the Carolingian rulers. (See **FRANKS**; **MEROVINGIANS**; **CAROLINGIANS**.) The accession of Pepin gave new vigor to the Frankish monarchy, which, under his son and successor, Charles the Great, crowned Emperor of the West by Pope Leo III. in 800, became a powerful empire. Christianity, civilization, and letters were protected during the reign of Charles the Great, and before his death he had extended the limits of his empire from the Baltic to the Mediterranean, and from the Bay of Biscay to the coast of Illyria. After his reign, however, this vast power crumbled to pieces. By the Treaty of Verdun, in 843, following the death of Louis the Pious, the son of Charles the Great, the Frankish Empire was divided among his sons. The lands east of the Rhine, whose inhabitants were predominantly Teutonic in race and language, were assigned to Louis the German; the part corresponding closely to modern France and the southern part of Belgium (the kingdom of the Western Franks) fell to the possession of Charles the Bald; between the two lay the territories of Lothair, who, in addition, received Italy and the Imperial title. The descendants of Charles the Bald (died 877) possessed little or none of the vigor of the early Carolingians.

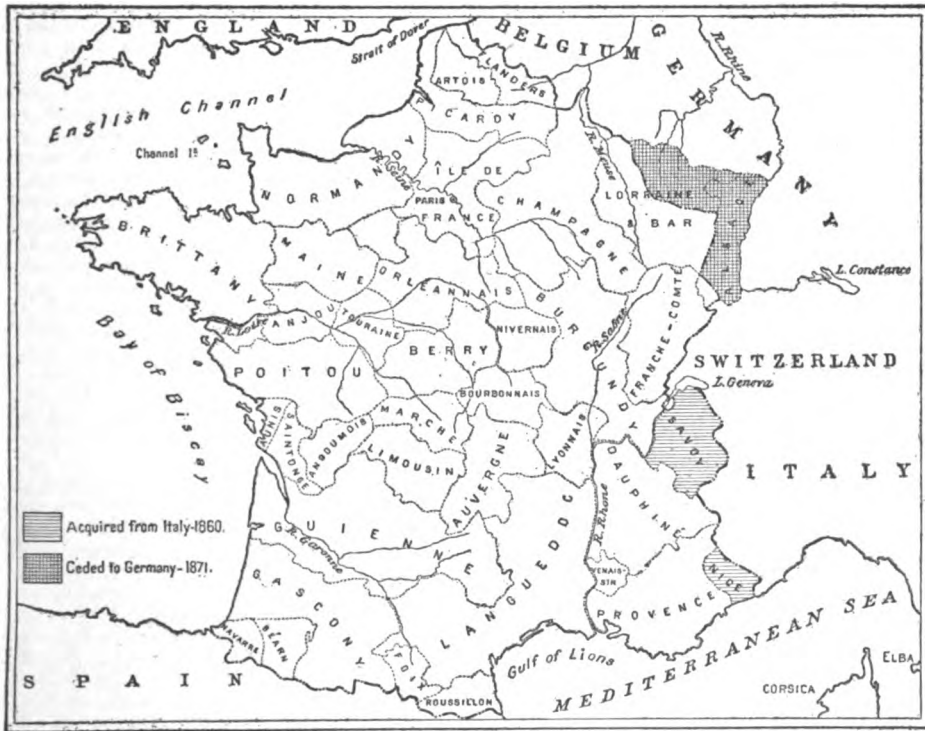
Louis the Stammerer (872-879) was the helpless creature of powerful nobles. Louis III. and Karlmann, sons of Louis the Stammerer, were forced to witness the loss of the Rhône Valley and the hostile incursions of the Northmen. In 884 Charles the Fat, King of Germany and of Italy, was made King of the western Franks, thus reuniting the realm of Charles the Great. After a stormy reign of three years, in the course of which Paris all but fell into the hands of the Northmen, he was deposed, and Odo, Count of Paris, was raised to the throne of France. Intestine wars desolated the land, and foreign assailants threatened it on every side. Under Charles the Simple (893-929), the ravages of the Northmen had assumed so persistent a character that the King was glad to purchase immunity from their encroachments by the cession of the territory subsequently known as Normandy (c.911). In the kingdom anarchy reigned paramount, the various governors established an hereditary authority in their several governments, and the Crown was by degrees deprived of the best part of its possessions. The power of some of the vassals surpassed that of the kings; and on the death of Louis V. the Carolingian dynasty was replaced by that of Hugh, Count of Paris, whose son, Hugh Capet, was elected King by the army and consecrated at Rheims in 987. See CAPETIAN DYNASTY.

At this period the greater part of France was held by almost independent lords, and the authority of the Capetian kings for more than a century extended little beyond Paris and Orleans. Among the most important of the great feudal vassals whose possessions made up the lands of the French Crown were the counts of Flanders, Vermandois, and Champagne, the dukes of Normandy, Burgundy, and Aquitaine, and the counts of Anjou and Toulouse. Louis the Fat (1108-37) was the first of the Capetians who ruled with a strong hand. He exalted the power of the Crown at the expense of the feudal nobles, and increased the royal territory. Louis VII. (1137-80), who took part in the Second Crusade, was almost incessantly engaged in war with Henry II. of England, whose marriage with Eleanor of Aquitaine made him master of that region and Poitou, in addition to his hereditary possessions of Normandy and Anjou. Louis's son and successor, Philip Augustus (1180-1223), wrested Normandy, Maine, Anjou, Touraine, and Poitou from John of England, and increased the power of the Crown in other parts of France. He took a personal share in the Third Crusade, and permitted the Pope to organize crusades against the Albigenses in the southern parts of the country. The power of the barons in the south was greatly weakened, and ultimately their territory was merged with the royal domains. By improvements in the administration of justice, the right of appeal to the royal courts was established, and the arbitrary power of the great vassals crippled. It was the policy of Philip Augustus to make use of the clergy and the jurists against the nobles, and it was the jurists especially who aided in the establishment of an absolute monarchy by their introduction of the principles of the old Roman law. Under Philip Augustus, France attained the leading place in Europe. The King knew how to win the friendship of the Pope without yielding to the Papal preten-

sions. He was powerful enough to defeat Otho IV. of Germany and his allies at Bouvines in 1214—a victory which secured his hold on the territories taken from King John. Improvements in the mode of administering the law were continued under his son, Louis VIII. (1223-26), and his grandson, Louis IX. (1226-70), who is one of the saints of the Catholic Church. Louis IX. engaged in the crusades, and died in an expedition against Tunis. He effected many modifications in the fiscal department, and left the kingdom stronger than ever before. His son, Philip the Bold (1270-85), annexed the county of Toulouse to the royal domains. Philip IV. (1285-1314), surnamed Le Bel, or the Fair, acquired Navarre, Champagne, and Brie by marriage. With a view to securing support against the secular and ecclesiastical nobility, with whom he was constantly at war, Philip gave prominence to the burgher element in the nation, and in 1302 he, for the first time, called together the *états généraux*, or general estates, at which the *tiers état*, or burgher class, appeared, together with the nobles and clergy. These changes were, however, accompanied by innovations in the fiscal and other departments of the Government, which were effected with haste and violence. His tyrannical persecution of the Templars showed the extent to which the regal power could be stretched. At the same time the removal of the seat of the Papacy to Avignon insured to France a predominant influence in European affairs. Under his successors, Louis X. (1314-16), Philip V. (1316-22), and Charles IV. (1322-28), the last direct descendant of the Capetian line, the rule of the kings of France became even more unlimited. Philip VI. (1328-50), the first of the House of Valois, a cousin of Charles IV. and the nephew of Philip IV., ascended the throne in accordance with the Salic law (q.v.). His reign and those of his successors, John the Good (1350-64), and Charles V., the Wise (1364-80), were disturbed by constant wars with Edward III. of England, who laid claim to the throne in right of his mother, a daughter of Philip the Fair. The Hundred Years' War (q.v.) began in 1339. In 1346 the English won a great victory at Crécy. In the battle of Poitiers (1356) John was made captive, and as the war dragged on, the State was reduced to bankruptcy, the nobility excited to rebellion, and the mass of the people greatly impoverished. Debasement of the coinage, onerous taxation, and arbitrary conscriptions brought the country to the verge of ruin, while the victories of England humbled the sovereign, decimated the French armies, and cut down the flower of the nation. The insurrection of the peasantry, known as the Jacquerie, occurred in 1358. The long and weak minority of Edward III.'s grandson, Richard II., diverted the English from the prosecution of their claims to the kingdom of France, which revived somewhat from the effects of its long and disastrous warfare; but during the minority of Charles VI. (1380-1422) the war was renewed with increased vigor on the part of the English nation, who were stimulated by the daring valor of Henry V. The signal victory won by the English at Agincourt in 1415: the treason and rebellion of the French princes of the blood, who governed the larger provinces; the ambition of the several regents, the ultimate imbecility of the King, the profligacy

of his queen, and the love of pleasure early evinced by the Dauphin, all combined to aid Henry in his attempts upon the throne. But the premature death of Henry, the persevering spirit of the people, and the extraordinary influence exercised over her countrymen by the Maid of Orleans (see JOAN OF ARC), concurred in bringing about a reaction, and after a period of anarchy Charles VII., the Victorious (1422-61), was crowned at Rheims. A fierce struggle, however, had still to be waged for the recovery of the French provinces from the hands of the English, who were not driven out from Normandy and Guienne until the middle of the century, when

fense of the interests of the States General, but in reality out of fear of the growing power of the monarchy. Forced to yield in the beginning, the King soon turned their own weapon against them. The States General at Tours, in 1468, summoned to consider the question of reforms in the administration and the finances, revoked nearly all of the concessions which the princes had succeeded in extorting from Louis in the Treaty of Conflans, three years before. In Charles the Bold of Burgundy, Louis encountered a formidable rival, who bade fair to erect between France and Germany a kingdom more powerful than either; but Charles fell in battle against the



MAP OF FRANCE SHOWING FORMER PROVINCES.

nothing but Calais remained in their possession. Charles obtained from the States General a regular tax (*taille*) for the maintenance of paid soldiers to keep in check the mercenaries and marauders who pillaged the country. He laid the real foundation for the absolute power of the King by obtaining the support of the third estate.

It remained for his successor, however, completely to break the power of the great vassals of the Crown, and to lay upon the ruins of feudal anarchy the secure foundations of absolutism. Louis XI. (1461-83) brought to the task the manifold resources of a wily, unscrupulous nature, true to the moral type of the Renaissance and to those ideals of statecraft which Machiavelli was soon to formulate in his *Principe*. The essential meanness of his character and of his entire career was atoned for only by the inestimable benefits which he conferred upon his country. Soon after his accession to the throne, the princes of the royal blood formed the League of the Public Weal against Louis, ostensibly in de-

Swiss in 1477, and of his possessions the Duchy of Burgundy passed to France. Louis XI. did not live to consolidate all of France under the Crown; but before his death the royal power had been extended over Berry, Burgundy, Provence, Anjou, Maine, and other regions.

Charles VIII. (1483-98), by his marriage with Anne of Brittany, secured that powerful principality, and consolidated the increasing power of the Crown. His invasion of Italy, in 1494, decided for all the future the relations of France to the other powers of Europe, and may be regarded as marking the beginning of the modern era of international policy. With Charles VIII. ended the direct male succession of the House of Valois. (See VALOIS, HOUSE OF.) Louis XII. (1498-1515), known as 'Le père du peuple,' was the only ruler of the Valois-Orleans family. The tendency of his reign was to consolidate the royal power, while the general condition of the people was ameliorated. Louis XII. engaged in bloody wars in Italy for the possession of Lombardy and

the Kingdom of Naples, but failed to achieve any permanent conquests. His successor, Francis I. (1515-47), of the Valois-Angoulême branch, still intent upon establishing French dominion in northern Italy, waged endless wars with the Hapsburgs, which wasted the resources of his kingdom. A concordat with the Pope, signed in 1516, secured to the King the right of nominating the Gallican bishops. In the reign of Francis the Assembly of Notables and Deputies superseded the States General. Nevertheless, the arts and literature were encouraged in this reign, as well as in that of the succeeding monarch, Henry II. (1547-59), who continued the struggle with the Hapsburgs. The Emperor Charles V., who had warred successfully against Francis I., being crippled by the events which grew out of his war with German Protestants, Henry seized the opportunity to wrest the bishoprics of Toul, Metz, and Verdun from the German Empire and annex them to France. In this reign began the persecutions of the Huguenots (q.v.).

With the death of Henry II. began a period of strife between factions which lasted for more than thirty years, and brought upon France the full horrors of civil war. The three sons of Henry II., Francis II. (1559-60), Charles IX. (1560-74), and Henry III. (1574-89), were weak-willed and incapable, and the history of their reigns is the story of a ceaseless struggle for mastery on the part of the powerful House of Guise, carried on under the pretense of a war for religion. Opposed to them were the Huguenots, led at first by the Prince of Condé and the great Coligny, and later by Henry of Navarre. Between the two, and playing off one against the other, was the gifted and unscrupulous Queen-mother, Catharine de' Medici. Nine civil wars were fought in the space of a generation (beginning with 1562), wars in which the Huguenots did not hesitate to call in foreign aid against their enemies, nor both parties to employ perjury and assassination. The massacre of Saint Bartholomew's (see BARTHOLOMEW'S, MASSACRE OF SAINT) perpetrated by Catharine de' Medici with the aid of the Guises, crushed the Huguenots into non-resistance for some five years, but served only to increase the power of the Guise family, who, as heads of the Catholic League, sought to exclude Henry of Navarre, the rightful heir to the throne, from the succession. Henry III., who thought his own life and crown in danger, caused the Duke of Guise and his brother, the Cardinal of Lorraine, to be assassinated (1588); but perished himself by the assassin's knife in the following year, and the crown passed from the House of Valois.

The accession of Henry IV. of Navarre (1589-1610), a Bourbon prince, descended from a younger son of Saint Louis, allayed the fury of the religious wars, but his conversion to Catholicism estranged his own party, for whom, however, religious toleration was secured by the Edict of Nantes (1598). The early part of his reign was disturbed by mutinies of the troops and the rebellions of the nobles. By degrees, however, Henry, through the astute policy of his Minister, Sully, and by his own personal popularity, raised the power of the Crown higher than ever, while he began a system of thorough administrative reform, which was arrested only by his death at the hands of the fanatic Ravaillac

in 1610. The first permanent French settlements in Canada were established under Henry IV.

During the first years of the reign of Louis XIII. (1610-43), the Government was in the hands of the Queen-mother, Maria de' Medici. The year 1614 is noteworthy as the date of the last meeting of the States General before 1789. After 1624 the real ruler of France was Cardinal Richelieu. His accession to power speedily put an end to the political intrigues which had disturbed the country during the regency of Maria de' Medici and the personal rule of Louis. Richelieu relentlessly repressed the risings of the Huguenots, who, under their ambitious leaders of the House of Condé, had become a menace to the State. La Rochelle, the last of their places of refuge, was taken in 1628, and Protestantism as a political force ceased to exist in France. The Huguenots, however, were not molested in the free practice of their religion, as guaranteed by the Edict of Nantes. Abroad, Richelieu carried on with marked success the contest against the House of Austria, which Henry IV. was about to resume at the time of his death. The Thirty Years' War in Germany afforded him the opportunity. Gustavus Adolphus was maintained largely by French subsidies, and after 1635 it was French aid that made possible the victorious campaigns of Bernhard of Weimar, Torstenson, and Baner. Alsace was acquired in 1639, and (though Richelieu did not live to see this) by the Peace of Westphalia (1648) France was confirmed in the possession of the bishoprics of Metz, Toul, and Verdun, and secured the right to intervene in the affairs of Germany as one of the guarantors of peace.

During the minority of Louis XIV. (1643-1715), Cardinal Mazarin exerted the chief authority under the regent, the Queen-mother, Anne of Austria. The refractory attitude of the Parlement of Paris and the repression of the nobility gave rise to another civil war (see FRONDE), but with the assumption of power by young Louis (1661), a new era commenced. Supported by the financial ability of Colbert, the military genius of Turenne, the engineering skill of Vauban, and the organizing talent of Louvois, Louis made France the great power of Europe. Franche-Comté and a part of Flanders were added to France by the Treaty of Nimeguen (1678). The ambitious schemes of Louis forced the powers of Europe in self-preservation to unite against him. Within, Louis reigned as absolute monarch, concentrating all the power of Government in himself. The progress of the people in the arts of peace was accomplished with rapid strides. Under the inspiration of the *Grand Monarque* French society attained a degree of culture and refinement that had not been known even in the days of the Italian Renaissance. This, too, was the Golden Age of French literature. The French language and customs exercised an immense influence on the manners of the higher classes throughout Europe, being not the least potent in distant and barbaric Russia. The Court of Louis XIV. became the model for European princes. There was, however, a dark side to the picture. The oppressive war taxes, the prodigality of the Court, the luxurious lives of the clergy, and the absolutism and bigotry of the aged monarch, combined to undermine the foundations of na-

tional prosperity and freedom. The latter part of Louis XIV.'s life was marked by a long series of misfortunes. The French armies were repeatedly defeated, the prestige of France was destroyed, and only the jealousy of its enemies saved it from utter humiliation. The War of the League of Augsburg (1689-97) was marked by the defeat of the French in the naval battle of La Hogue (1692), which wrested from them the mastery of the seas. With the outbreak of the War of the Spanish Succession (see SUCCESSION WARS) came the downfall. Louis XV. (1715-74) succeeded to a heritage whose glory was tarnished, and to a throne whose stability was shaken to its very foundations. The reign of Louis XV. presents nothing worthy of notice except the acceleration in the process of dissolution of the monarchy and the development of revolutionary influences. The regency of the profligate Duke of Orléans brought the nation to the verge of bankruptcy. The struggle with England in the Seven Years' War (q.v.) stripped France of Canada and Louisiana, while the capricious change of policy which the King's mistress, Mme. de Pompadour, forced upon the Government, brought contempt upon the country. During this reign the Order of the Jesuits, over which there was much controversy, was banished from France, 1764. In 1774 Louis XVI., a well-meaning but weak prince, succeeded to the throne and to the consequences of all the errors of his predecessors. His first ministers, Maurepas, Turgot, and Mallesherbes, failed in their attempts to carry out the necessary reforms, and were compelled to yield to the intrigues of the nobility, and resign their places. They were succeeded by the financier Necker, who endeavored, by economy and method, to arrest the impending bankruptcy of the State, and succeeding ministers (Calonne, Loménie de Brienne) made futile attempts to diminish these financial disorders by new forms of taxation, which were generally opposed by the Court. The nobles, the clergy, and the third estate were alike clamorous for a meeting of the States General, the privileged estates wishing to impose new taxes on the nation, and the third estate determined to inaugurate a thorough and systematic reform. After much opposition on the part of the King and Court, the States General, which had not met since 1614, assembled at Versailles on May 5, 1789.

France was ripe for revolution. Thoroughgoing reforms at the beginning of Louis XVI.'s reign might have averted the catastrophe, but a vacillating King, and ministers strong enough to aspire after the good without the power to achieve it, had served only to intensify the feeling of universal discontent, and to bring out in greater contrast than ever the irreconcilable antagonism between the new spirit of the age and the antiquated forms of government and society in France. In other countries of Europe, perhaps, the condition of the lower classes was as unhappy, the incapacity of Government as apparent, the survival of feudal customs as oppressive as in France; but in France alone had the newer intellectual life developed such activity as to render it incompatible with the continued existence of ancient institutions. Absolutism in France had been developed at the expense of feudal rights and popular liberties, and had

drawn to itself almost all the functions of national life; but absolutism since the time of Louis XIV. had failed in its duty to the nation, and appears in the *ancien régime* as a ponderous, rusty machine, making itself felt chiefly by its weight.

Under the old régime the internal administration of the country rested in the hands of the King's Council and of the Comptroller-General. Finance, justice, and legislation were all under the control of this powerful Minister, who acted in conjunction with various subsidiary councils. The country was divided into 32 provinces or generalities, each under an intendant, who was the agent of, and responsible to, the Comptroller-General. Except in the *pays d'état*, where the local magistrates retained some measure of self-government, the intendant united in himself the various functions of administration: police, public works, the care of the poor, and, chief of all, taxation. Through his subdelegates he collected every year the amount of the *taille* and other direct taxes assessed upon the province by the King's Council. The process of administration was cumbersome. Minute matters of local importance had to be passed upon by the Comptroller-General in Paris, and as a result, the provincial administration, though meaning probably to be neither harsh nor unjust, succeeded for the most part in being both.

Socially, the people of France were divided into two great classes—those who paid the *taille*, and those who did not. Among the latter were the nobility, numbering some 140,000 souls, and owning about one-fifth of the soil. They held exclusive possession of the high offices at Court; they were exempt from the *corvée* or forced work on the roads, and from service in the militia. Originally exempted from payment of the *taille*, because it was regarded as a commutation paid by the lower classes in lieu of military service, the nobles retained their exemption long after they had ceased to render military service. In the payment of indirect taxes, they also succeeded in evading a large part of their share. For the nobles there were the old privileges and immunities, the ancient rights of fines and dues and tithes, of hunting and fishing and warren, of toll on mill and wine-press; but the ancient service of protection and of guidance to the vassal were gone. A distinction, however, should be made between the Court nobility, who lived in magnificence at Paris or Versailles, and aided in heaping up the enormous deficit, with which the extravagance of the Court was weighing down the country, and the country nobles, who constituted the great body of the class, and lived in retirement on their estates, poor, inactive, since absolutism would make no use of them as its agents, and a burden, though very often an unwilling burden, to their tenants. The Church comprised some 60,000 monks and nuns, and 70,000 of the secular clergy. Between the prelates of the Church and the great body of the poor priests was the same gulf that separated the Court nobility from the resident nobles. The mass of the French priesthood was unselfish, devoted, zealous in its duties; but among the higher clergy, the archbishops and bishops, there were many who were no less selfish and ambitious than the nobility. Like the nobility, they were eager to escape their fair share of taxation,

and hungered after dues and tithes. The Church owned about one-fifth of the land in France, and, with the nobility and the Crown, shifted its burdens upon the remaining two-fifths. Privilege ruled also in the middle classes. In the towns the line of cleavage between the bourgeoisie and the artisan population was definite. Trade and industry were regulated by the guilds after the selfish spirit of mediæval times. Municipal offices were put up by the Government for sale, and as they generally carried with them certain privileges and immunities, chief among them relief from taxation, were greatly sought after. Powerful corporations were as assiduous in swearing off taxes as their modern successors. The rich bourgeoisie, in short, vied with the nobility and the Church in evading the burdens of State.

It was upon the peasantry, then, that the full brunt of taxation fell. Serfdom was almost extinct in France, more than one-fifth of the land was held by peasant proprietors, and, strangely enough, throughout the eighteenth century more and more land passed into the hands of the peasants in spite of the almost intolerable exactions imposed upon them. Yet Taine has calculated that four-fifths of the fruits of the peasants' labors were taken away by the Government in the form of *taille*, *corvée*, poll-tax, *vingtièmes*, and the *gabelle* or salt tax. The lands of the Church and of the nobles were cultivated by the peasants under the *métayer* system, where the owner supplied the stock and implements, and the peasant the labor, both sharing equally. The general state of agriculture was wretched. The methods pursued were those of the early Middle Ages, want was the chronic condition of the working population, famine a frequent phenomenon, and mendicancy increased to an enormous extent. In 1777 there were one and a quarter million beggars in France. Rioting was frequent and the criminal class drew recruits in plenty from among the proletariat of town and country.

Against the critical and utilitarian spirit of the eighteenth century, the irrational and antiquated in Government and society could not hope to maintain itself. Absolutism was assailed by Montesquieu in his *L'Esprit des lois*, which held up the ideal of constitutional liberty as realized in Great Britain; Voltaire waged a ceaseless warfare of keenest ridicule and biting wit against the absurd and anomalous in Church, State, and society. Rapidly the conviction grew of the utter worthlessness of existing things, and of the necessity for immediate and radical change. The revolt against the actual attained its climax in Rousseau. In the face of privilege, injustice, and oppression, he invoked the law of nature to establish the equality of man. To the peasantry and the artisan class equality meant the just redistribution of public burdens; to the cultured, ambitious bourgeoisie, an equal opportunity with the nobles for sharing in the national life.

For an account of the period from 1789 to 1799, see FRENCH REVOLUTION, THE.

Bonaparte showed consummate skill in reorganizing and centralizing the Government, which had been too much localized under the Revolution. He then took the field in the spring of 1800, led an army over the Alps, and attacked the Austrians in Italy, while Moreau was intrusted with the conduct of the campaign in

southern Germany. The victories of Marengo and Hohenlinden decided the fate of the war. In 1801 the Peace of Lunéville was concluded with Austria and the German Empire, and the boundaries of France were extended to the Rhine. In the Peace of Amiens in 1802, England recognized the changes wrought by the Revolution and Bonaparte in the map of Europe. The period of respite from war was employed by the First Consul in revivifying trade and industry, and in obliterating, both in private and public life, the devastations wrought by the Reign of Terror. In 1804, after an appeal through universal suffrage to the nation, Bonaparte became Emperor, as Napoleon I. The Pope came to Paris to crown Napoleon and his wife, Josephine; a new nobility was rapidly created, and the relatives and favorites of the Emperor received vanquished kingdoms and principalities at his hands. In 1805 Napoleon assumed the title of King of Italy. Austria, who ventured to rise up against him, was overthrown, together with her ally, Russia, at Austerlitz (1805), and compelled to sign the Peace of Pressburg, by which the existence of the Holy Roman Empire was formally brought to an end. Prussia was humiliated at Jena and Auerstädt (1806), and brought to the verge of destruction; the Russians were overthrown at Friedland (1807), and the Czar was forced to enter into an alliance with the French Emperor (1807), by which the arbitrament of affairs in Europe was divided between the two. In the meanwhile, however, England, having renewed the struggle against France, had gained the complete mastery of the seas by the victory of Trafalgar (1805). Against this arch-enemy Napoleon brought to bear the united strength of Europe in an effort to destroy her commercial supremacy by a system of ruinous blockades. (See CONTINENTAL SYSTEM.) In 1807 the forces of Napoleon invaded Portugal and expelled the reigning family. In 1808 he took possession of Spain, whose inhabitants rose against him, and which became a great battlefield between the English and French. The height of Napoleon's power was attained in 1809, when the Austrians in a third war were overthrown at Wagram, and in the Treaty of Schönbrunn suffered a further loss of territory. By his marriage with the Archduchess Maria Louisa, daughter of the Emperor of Austria, Napoleon attempted to give to his throne the prestige of birth, which alone it lacked. For some years, while his military operations were confined to the Spanish Peninsula, Napoleon could devote his energies toward consolidating his government and organizing a thoroughly centralized administration. His impress on the character of French institutions has persisted to the present day; the legal system of France is based primarily on the Code Napoléon (1804), and the relations between Church and State are still largely determined by the Concordat which the Emperor concluded with the Pope in 1801. This period, however, was the poorest in respect to the literary and scientific development of the nation, for men were too much trammelled by police supervision and military discipline to exercise freedom of thought.

The disastrous Russian campaign of 1812 was the beginning of Napoleon's downfall. Of the grand army of more than 500,000 men which he led into Russia in June, only 100,000 recrossed the Niemen in December under the command of

Murat, the Emperor having hastened to France to raise new levies. Europe now rose against the conqueror. In February, 1813, Prussia entered into an alliance with Russia, and these powers were soon joined by Austria and Sweden. Napoleon defeated the Russians and Prussians at Lützen and Bautzen in May, and gained a splendid victory over the Allies at Dresden in August; but in October he was overwhelmed in the great battle of Leipzig. He was driven from Germany; France was invaded, and on March 30th Paris surrendered to the Allies.

Napoleon was compelled to abdicate and retired to the island of Elba, the sovereignty of which had been granted to him. His family were declared to have forfeited the French throne. Of all her conquests France was allowed to retain only a few strips of territory on her eastern border, together with Avignon and Venaissin. On May 3d Louis XVIII., the brother of Louis XVI., made his entry into Paris, and the period of the First Restoration began.

The conduct of the restored Bourbons was not such as to conciliate the nation; they returned loaded with debts, and surrounded by the old nobility and clergy, who had not learned to renounce their former privileges, and who looked upon the generation of Frenchmen which had arisen during their absence as their natural enemies. The hopes of a liberal government, aroused by the granting of a constitution in the *Charte Constitutionnelle* (June 4, 1814), failed of realization. A narrow spirit influenced the policy of the King, which led to the establishment of a strict censorship, the extension of the powers of the police, and the persecution of all the adherents of the Empire. The lower classes and the army, who were alike sensible of the humiliating reaction which had followed the former excitement of war and conquest, were treated by the returned émigrés with indifference and contempt. The general discontent with the monarchy afforded the exiled Emperor an opportunity of which he was not slow to avail himself. On February 26, 1815, Napoleon left Elba and on March 1st he landed in France. Crowds followed him; the soldiers of the Empire flocked around his standard, and the Bourbons fled before him. The news of his landing spread consternation throughout Europe. The deliberations of the Congress of Vienna (q.v.) were suspended; and on March 25th a treaty of alliance was signed at Vienna between Austria, Russia, Prussia, and England, and preparations were at once made to put down Napoleon and restore the Bourbon dynasty. At first the prestige of success seemed to attend Napoleon, but on June 18th he met his final defeat at Waterloo (q.v.). On July 8th Louis XVIII. reentered Paris. A week later Napoleon gave himself up to the English and was sent to the island of Saint Helena.

The Second Restoration gave occasion to many pledges of a more liberal policy on the part of Louis, but these were disregarded in the Royalist reaction that now set in. In spite of the King's promises of amnesty, many of those who had gone over to Napoleon during the Hundred Days were brought to trial before tribunals expressly instituted for that purpose. The most prominent of the victims was Ney, who was found guilty of treason, and shot December 7, 1815. A number of peers, created by Napoleon, were expelled from the Upper Chamber. In some of the prov-

inces the adherents of the Bourbons entered upon a course of violence and murder, the so-called 'White Terror.' Long after physical violence subsided, reactionary legislation went on. The suffrage law was repeatedly tampered with, until the preponderance of power had been placed in the hands of the great land-owners. In matters of public education the King was completely under the control of the clergy, who constituted the extreme party among the reactionists. In 1824 Louis XVIII. was succeeded by his brother, the Duc d'Artois, as Charles X. Ministerial incapacity, want of good faith, general discontent, and tendencies to absolutism characterized this reign, which was abruptly brought to a close by the revolution of July, 1830. With Charles X. the direct line of the House of Bourbon came to an end. Louis Philippe, Duke of Orleans, was elevated to the throne by the will of the people. The first years of the reign of this 'Citizen King,' who was the representative of the prosperous commercial and industrial classes, were disturbed by insurrectionary riots of the silk-weavers in Lyons and disturbances in Paris. Attempts on the King's life were frequent; but the progress in material prosperity made the Government popular with the bourgeoisie, and for a time it held its ground. The warlike propensities of the nation found an outlet in the conquest of Algeria (1830-47). But the determined resistance of the King to the growing demand for electoral reform led at last to open insurrection in Paris. Louis Philippe abdicated, February 24, 1848. A provisional government was at once instituted, including such men as Dupont de l'Eure, Lamartine, Ledru-Rollin, Etienne Arago, Crémieux, and Garnier-Pagès. On February 27th the Second Republic was formally proclaimed. Under the auspices of Louis Blanc the new Government proceeded at once to exert the activities of the State in behalf of the working classes, for whom it was proposed to establish national workshops. On April 27th a decree was issued abolishing slavery in the French colonies. In the meanwhile elections were held for a Constituent Assembly, which met on May 4th, and which a few days later elected an Executive Commission to conduct the affairs of the Republic. The radical Republicans (the so-called Red Republicans) and the disappointed Socialists soon manifested their hostility to the new order by a resort to arms. There were Red Republican disturbances in Paris on May 15th, and a great Socialistic uprising in the capital, June 24th-26th, in which a large mass of the Parisian populace was involved, was suppressed by General Cavaignac only after terrible bloodshed. On November 4th the Constituent Assembly completed the framing of a regular republican constitution for France, and on December 10, 1848, Louis Napoleon, nephew of Napoleon I., was elected President, entering upon his office December 20th. One of the first acts of the Administration of Louis Napoleon was the sending of a French expedition for the restoration of the temporal power of Pope Pius IX., which was accomplished in July, 1849. In May, 1849, the Constituent Assembly closed its sessions and was succeeded by the Legislative Assembly. The President betrayed the true nature of his policy by appointing on October 31, 1849, a thoroughly Bonapartist Ministry. (See NAPOLEON III.) By the famous coup d'état of December 2, 1851, he violently set

aside the Constitution, and assumed dictatorial powers. He adopted his uncle's methods in many ways, concealed his seizure of the title by a sham plebiscite, and became Emperor of the French, December 2, 1852.

Napoleon III. established a government which was virtually a perfected absolutism, veiled by the forms of a parliamentary régime and a system of universal suffrage controlled by the agents of the Emperor. There was a Senate, which was the guardian of the Constitution, and a legislative body; but the Senate was almost entirely appointed by the Emperor, and in the Lower House there was no freedom of debate. The freedom of the press was practically abolished. Force, however, could not be depended upon as a permanent sanction of legitimacy, and to secure the support of the people it was necessary for Napoleon to enter upon a brilliant foreign policy. The alliance of England and France against Russia in 1854 and the outcome of the Crimean War were personal triumphs for the Emperor. With the meeting of the Congress of Paris in 1856 that city became the diplomatic capital of Europe. The Emperor aspired now to play the rôle of arbiter of Europe. In 1859, as the champion of oppressed nationalities, he came to the aid of Italy against Austria, and as a reward obtained possession of Savoy and Nice. He failed, however, in his attempt at intervention in Poland in 1863 and in the affair of Schleswig-Holstein in the following year. Actuated, perhaps, by the dream of a French hegemony in Latin America, he seized upon the disturbed condition of Mexico as an opportunity for invading that country and establishing a dependent empire there under Maximilian of Austria. The fall of Maximilian's empire in Mexico was a fatal blow at his prestige. The defeat of Austria, in 1866, and the consequent rise of Prussia, threatened to deprive France of the leading position she occupied in European affairs. At home, the period of the Second Empire was marked by great industrial development. Stimulated by the magnificence of the Court, life took on an aspect of almost reckless luxuriousness. Vast fortunes were made in railroad building, Government contracts, and speculation. A great system of public works was carried out, including the building up of a new and beautiful Paris. (See HAUSSMANN.) The international expositions of 1855 and 1867 testified to the prosperity of the country. Nevertheless, signs of dissatisfaction were not wanting, and after 1863, in proportion as Napoleon's foreign policy broke down, discontent and criticism grew loud in France. As early as 1862 the Emperor was compelled to allow some measure of debate in the legislative bodies, and in 1867 this was largely increased. Opposition to the Empire, however, grew bolder and fiercer, until in 1869 the Emperor saw himself driven to grant a responsible Ministry. It was soon found that the responsibility of the Ministry was fictitious, and that the Emperor availed himself of its protection to cloak his own acts of personal government. The result of the appeal made to the nation in 1870, on the plea of securing its sanction for his policy, was not what he had anticipated; and the 50,000 dissentient votes given by the troops in this plebiscite revealed a hitherto unsuspected source of danger. The necessity, however, of regaining his lost prestige by a brilliant foreign policy, led him to enter

once more upon an aggressive course of action in European affairs. The question of the succession to the vacant Spanish throne precipitated a crisis between France and the Prussian Government, whose foreign policy was guided by the genius of Bismarck. Deceived by the false representations of his Ministers with regard to the efficiency and preparedness of the French Army, Napoleon allowed himself to be carried into war with a power which but recently (see SEVEN WEEKS' WAR) had revealed its surpassing military strength, and which, since its triumph over Austria in 1866, had been silently preparing for the decisive conflict with the ancient enemy of Germany. Rarely has the bubble of power been so suddenly pricked as in the case of Imperial France in 1870. (See FRANCO-GERMAN WAR OF 1870-71.) After a quick succession of utter defeats for the French, Napoleon surrendered at Sedan, September 2, 1870. On September 4th the Corps Législatif declared the Emperor and his descendants forever excluded from the throne, and created a Government of National Defense. France was proclaimed a republic. A period of stress and disorder ensued. An armistice in January, 1871, was followed by the meeting of the first National Assembly of the Third Republic at Bordeaux in February. The preliminary treaty of peace with Germany was signed at Versailles on February 26th and ratified by the National Assembly on March 1st. France agreed to cede Alsace, together with parts of Lorraine, including Metz, and to pay an indemnity of 5,000,000,000 francs. Not until the final payment of the enormous war indemnity in September, 1873, was France wholly freed from the humiliating occupation by foreign troops. In the spring of 1871 the violent outbreak of the Commune (q.v.) at Paris convulsed France. On August 31, 1871, Thiers, who had been elected Chief of the Executive by the National Assembly in February, received from that body the title of President of the Republic.

There was not for years a true republican majority in France, but the adherents of the Republic were able to hold their own because of the divisions in the ranks of the Monarchists. (See POLITICAL PARTIES, paragraph on France.) In 1873 Thiers resigned the Presidency, and Marshal MacMahon was elected by Monarchist votes, and confirmed in the Presidency for a period of seven years (the Septennate). In 1875 the Assembly adopted laws providing for the constitution of the National Legislature, the legislative power to be vested in a Senate and a Chamber of Deputies. In 1877 President MacMahon was suspected of reactionary designs; but the republican form of government was, nevertheless, greatly consolidated during his tenure of office, and continued to enjoy the increasing confidence of the nation. On the resignation of MacMahon, in 1879, Jules Grévy was elected to succeed him.

After 1879, under various changes of Ministry, the policy of the Government continued steadily republican. At the instance of Jules Ferry, a decree was issued in 1880 by which the Jesuit schools were closed, and all religious orders that would not submit to certain conditions necessary to gain the State sanction were dissolved. In 1884 the Constitution and the Senatorial electoral system were revised and put upon their present basis. Members of the royal houses

that had formerly ruled France were declared ineligible for military or civil office. In 1881 France entered upon an active colonial policy by undertaking a military expedition to Tunis and establishing a protectorate over the country. In 1883 France enforced a claim of certain rights over the northwestern part of Madagascar by taking possession of several ports. Rapidly extending its influence in spite of considerable reverses, it succeeded in establishing a protectorate over the island in 1885, and in 1896 reduced Madagascar to the rank of a French possession. The advance of France in Indo-China led to war with China in 1883-85, which resulted in the establishment of a French protectorate over Annam and Tongking. M. Grévy was re-elected in 1885, but resigned in 1887. He was succeeded by Sadi Carnot, in whose Administration the Panama Canal scandal occurred, involving many prominent men and weakening the Government.

The Carnot Administration, too, witnessed the most formidable of all the attempts made to overthrow the Third Republic. This was the agitation commenced by all the discontented elements, representing every possible shade of political opinion, and united only by their hostility to the existing Government, under the leadership of General Boulanger (1888). For a time it seemed as if the Republic was fated to fall before a coup d'état. Boulanger, however, lacked the requisite decision of character, lost his popularity, and ultimately fled the country. Orleanists, Bonapartists, and Radicals alike had contributed toward his success, and the personal revelations made by Mermeix, which revealed the true character of Boulanger, not only discredited the opposition, but caused a very strong reaction in favor of the Government. This growth of republican sentiment received an additional impulse in 1891, when Cardinal Laviege, the head of the Clerical Party in France, declared himself in favor of the Republic. This declaration was a great blow to the Royalists, whose chief strength has always lain in their connection with the Church. In 1894 President Carnot was assassinated at Lyons by an Italian anarchist, and was succeeded by Casimir-Périer, who resigned in January, 1895, and was succeeded by Félix Faure. The strengthening of the Franco-Russian *entente* was the most notable fact of these years, and after that the Dreyfus case. (See DREYFUS.) Emile Loubet was elected President in 1899, upon the death of President Faure. A detailed account of the last twenty years of French political history will be found under POLITICAL PARTIES.

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FRANCE, ISLE OF. See MAURITIUS.

FRANCE, REFORMED CHURCH OF. See HUGENOTS.

FRANCE, fräns, ANATOLE (1844—). The assumed name of Jacques Anatole Thibault, a noted French critic, a distinguished novelist and the most graceful humorist of contemporary France. His early poems (1873 and 1876) are negligible, as is the humorous story, *Jocaste et le chat maigre* (1879), but *Le crime de Sylvestre Bonnard* (1881, often translated) is a charming idyl of child and scholar's life, full of genial irony that grows more caustic in *Balthazar* (1889), while in *La pâtisserie de la reine Pédaque* (1893), and *Opinions de M. l'abbé Jérôme Coignard* (1893), the story is little more than a veil for the expression of an epicurean skepticism. His latest stories, *L'orme du mail* (1897), *Le mannequin d'osier* (1898), *L'anneau d'améthyste* (1898), *Monsieur Bergcret à Paris*

(1900), frankly call themselves *Histoire contemporaine* and seek to reflect the thoughts of typical Frenchmen of culture. All these and his other novels as well, e.g. *Thaïs* (1890), *Le lys rouge* (1894), are the fiction of a critic rather than of a romancer, and his journalistic reviews, *La vie littéraire* (5 vols., 1888-93), as well as his philosophic *Le jardin d'Épicure* (1895), show more of the spirit of Renan than that of any other; yet France has in him something, too, of Racine, of Voltaire, and of Flaubert. France is perhaps "the ultimate flowering of the French genius," as Lemaitre, himself a great critic, has said of him.

FRANCE, JOSEPH (1787-1869). A French publicist and reformer, born in Lorraine. He entered the army in 1815, obtained a commission in the gendarmerie in the West Indies, and was stationed in Martinique, where he rose to the rank of colonel in 1834. From 1836 to 1846 he had supreme command of the military police in the island, and by his humanity, impartiality, and firmness endeared himself to the lower classes of the population, and to the slaves in particular, who looked upon him as their champion. To this title he actually won the right when, in 1841, he published *La vérité et les faits, ou l'esclavage à nu*, in which he set forth the cruelties of the colonists toward the negroes. This work created such a sensation that the Governor, fearing its effects, removed France from his command, and sent him a prisoner to Paris to stand trial for publishing seditious writings. This trial resulted in his losing permanently his commission, but, after the Revolution of 1848, and the abolition of slavery in the colonies, France was chosen by the electors in Martinique to represent them in the Constituent Assembly at Paris. From 1852 until his death he was a member of the colonial council of Martinique. Besides numerous contributions to the *Revue Abolitioniste*, he published *Histoire de la Guadeloupe* (1885); *Les corsaires français dans les Antilles* (1857); *Histoire de la filibuste* (1860); *Questions coloniales* (1860); and *Statistique physique et politique de la Martinique* (1861).

FRANCESCA, frân-chês'kâ, PIERO DELLA (c.1420-92). An Italian painter of the Umbrian School, whose real name was Pietro di Benedetto de' Franceschi. He was born at Borgo San Sepolero. His work shows the influence of Paolo Uccello (q.v.), and he was an assistant of Domenico Veneziano, from 1439 to 1450, in the painting of the frescoes in the churches of San Egidio and Santa Maria Nuova, Florence. Upon an invitation to Rome by Nicholas V., he painted two frescoes which were destroyed when Raphael painted the Stanze of the Vatican. In 1451 he painted a fresco in the Church of San Francesco at Rimini for Sigismondo Malatesta. He was also invited to Ferrara and assisted in the decoration of the Schifanoia Palace. Francesca was a complete master of oil painting; he was the first to use light to give a subduing effect in color, and to preserve the real value of shadows. There is a dignity in his portraiture: an absence of emotion and a solemnity about his figures. As a student of linear and aerial perspective, he was a forerunner of Leonardo da Vinci, especially in his studies of light and shade and his space values. Two of his most noted pupils were Luca

Signorelli and Melozzo da Forlì. He died October 12, 1492, and was buried in the cathedral of his native place. Some of his principal works are: "Saviour Rising from His Tomb," museum at Borgo San Sepolcro; altar-piece, "Virgin and Child," Church of the Misericordia at Borgo San Sepolcro; "Nativity," unfinished, at the National Gallery, London; a number of works at Florence, Perugia, and Venice. Consult: Müntz, *Le tour du monde* (Paris, 1883); Vasari, *Vite*, ed. by Milanesi (Florence, 1878-85), English translation, Blashfield and Hopkins (New York, 1897); and Waters, *Piero della Francesca* (London, 1901).

FRANCESCA DA RIMINI, dà rě-mě-ně (†c. 1288). The daughter of Guido da Polenta, the Lord of Ravenna. She was given by him in marriage to Giovanni, sometimes called Gianciotto, or Sciancato (the Lame), the second son of Malatesta, the podestà of Rimini. Malatesta was a Guelph leader who had made himself the master of all the region about Rimini. He had, besides Giovanni, a son, Paolo, called the Handsome, whom Giovanni sent to Ravenna to bring back his bride. Francesca and Paolo fell in love, and Giovanni, finding them together, killed them both (c.1288). The tale has many modifications, but this is the simplest outline of the story. It has been made the subject of many pictures and plays. The best known of the pictures are "Paolo and Francesca," by Ingres (1819), in the Antwerp Museum; the same by Ary Scheffer (1835), in the Wallace collection; the same by G. F. Watts (1879), and the "Death of Paolo and Francesca," by Cabanel (1870), in the Luxembourg. Besides Dante and Boccaccio, Leigh Hunt made this story the subject of a poem (1816), Silvio Pellico wrote a tragedy on it (1818), G. H. Boker made an acting version of it (1864), and recently Stephen Phillips produced a dramatic poem (1899), and the Italian poet d'Annunzio a drama (1901). There is an opera of this name by Hermann Götz (1877), which was completed by G. Frank, a symphonic poem for orchestra by Tchaikovsky (1877), and an opera by Ambroise Thomas, *Francesca da Rimini* (1882). Consult Uriarte, *Francesca da Rimini, dans la légende et dans l'histoire* (Paris, 1882).

FRANCESCHINA, frān'chēs-kě'nā. The finely drawn chief character in Marston's *Dutch Courtesan*. She is a woman who, with all her attractiveness, is revengeful and implacable.

FRANCESCHINI, frān'chēs-kě'ně, BALDASSARE (1611-89). An Italian painter of the Florentine School. He was born at Volterra, and is also called Volterrano Giuniore, to distinguish him from Daniele da Volterra. He was a pupil of Cosimo Roselli and Giovanni di San Giovannino in Florence, and afterwards studied the antique in Rome. He was a very facile painter, but, like the rest of the Mannerist group, was deficient in technique and in sentiment. His works are principally in Florence, where he painted in the Pitti Palace and in the Uffizi, and at Volterra, especially in the Convent of Santa Radia di San Giusto. His masterpiece is the "Coronation of the Virgin," in Santa Annunziata, Florence.

FRANCESCHINI, frān'chēs-kě'ně, MARCAN-TONIO (1648-1720). An Italian painter, born at Bologna. He studied under Galli and was the

pupil and friend of Carlo Cignani, and worked with him at Bologna, Modena, Reggio, and elsewhere. One of his greatest paintings, a fresco at the Council Palace in Genoa, representing scenes from the history of the Republic, was destroyed. Others of his large decorative works are frescoes in the Pallavicini and Durazzo palaces in Genoa, and a ceiling in the Ranazzi Palace in Bologna. He was invited to Vienna, and there painted in the Lichtenstein Palace frescoes with scenes from the life of Jacob and Rachel. Franceschini was in many ways a remarkable artist; he had a genius for composition, and all that was mannered and artificial in his imitators was redeemed in him by the fertility of his imagination and the warmth of his color. His easel pictures include "The Annunciation," Bologna gallery; "Birth of Adonis," and "The Magdalen," Dresden gallery; "San Carlo Borromeo Helping the Plague-Stricken," and "Diana," in the Vienna gallery.

FRANCESCO DI PAOLA, frān-chēs'kó dē pou'lā. See FRANCIS OF PAOLA.

FRANCHE-COMTÉ, frānsh' kōn'tā' (Fr., free county). An old province in the east of France, in the basin of the Rhône, comprising what now forms practically the departments of Doubs, Haute-Saône, and Jura, and part of the Department of Ain. It was inhabited in ancient times by the Sequani, and was the *Maxima Sequanorum* of the Romans. In the fifth century it was conquered by the Burgundians, and later formed part of the Frankish monarchy. It passed afterwards through various hands, until, in 1156, it came into the possession of the Emperor Frederick Barbarossa. In 1384 it was annexed by Philip the Bold of Burgundy. Through the marriage of Mary of Burgundy to Maximilian, Franche-Comté became a possession of the Hapsburgs, and, together with the Netherlands, it passed to the Spanish branch of that house. The acquisition of the region was one of the chief objects of Louis XIV.'s external policy; his armies overran the province in 1668 and 1674, and he was confirmed in his conquest by the Treaty of Nimeguen (1678). The name first appears in the twelfth century, and indicates freedom from Imperial taxation, except the annual gift to the sovereign of a stipulated sum. Its old capital was Besançon.

FRANCHETTI, frān-kět'tē, BARON ALBERTO (1860-). An Italian operatic composer, born at Turin. He was a pupil of Nicolò Coccon and Fortunato Magi. Proceeding to Dresden, he studied under Draeseke, after which he entered the Munich Conservatory. He belongs to the new school of Italian composers, and is regarded as one of its most successful exponents. His principal and most important opera was the four-act drama legend *Asraële*, produced in 1888. Other and scarcely less successful operas are: *Cristoforo Colombo* (1892); *Fior d'Alpe* (1894); *Il signor di Pourceaugnac* (1897). He also wrote many smaller works, the best of which is a symphony in E minor.

FRANCHEVILLE, frānsh'vél', or **FRANQUEVILLE**, frānk'vél', PIERRE (1548-c.1618). A French sculptor, born at Cambrai. Against his parents' wishes he went to Paris in 1564 to study art, and, recalled home to follow a literary career, left his country secretly, making his way to Germany and Austria.

At Innsbruck he found a patron in the Archduke Ferdinand, who enabled him to study under Giovanni da Bologna at Florence. He assisted that famous master in many of his works; also accompanied him to Genoa, where the statues of "The Four Evangelists," in the cathedral, bear witness to his early proficiency. The rapidly increasing reputation acquired by such works as the "Allegorical Figures of Humility, Chastity, and Wisdom," in the Nicoline Chapel at Florence, led to his being summoned to Paris in 1601 by Henry IV., who appointed him Court sculptor. In that capacity he executed numerous statues, busts, and vases for the royal palaces and gardens. Prominent among these are "David with the Head of Goliath" (1612); "The Conquered Nations" (1614), four figures, formerly part of the equestrian monument of Henry IV.; and "Orpheus," all in the Louvre. He was a man of great versatility, and active as an architect, painter, and writer.

FRANCHI, frāŋ'kê, AUSONIO (1821-95). The pseudonym of Cristoforo Bonavino, an Italian philosopher, born at Pegli, near Genoa. He was ordained a priest, but abandoned this career, and gave himself to the study of philosophy, under the name of Franchi, by which he was always known. He became professor at the University of Padua in 1860, and at the Academy of Milan in 1863. Among his works are: *La filosofia delle scuole italiane* (1863); *La religione del secolo XIX.* (1860); *Del sentimento* (1854); *Il razionalismo del popolo* (1862); *Saggi di critica e polemica* (1871); and *Lettere su la teoria del guidizio* (1870).

FRANCHI, FABIAN and LOUIS DEL. In Boucicault's drama *The Corsican Brothers*, the twin brothers whose mysterious sympathy is the basis of the play.

FRANCHISE. In England, a royal privilege, or branch of the Crown's prerogative, subsisting in the hands of the subject. Being derived from the Crown, franchises must arise from royal grant, or in some cases may be held by prescription, which presupposes a grant. The subjects of franchise correspond with what in Scotland are called regalia (q.v.). The right to take waifs, estrays, wrecks, treasure-trove, royal fish, and forfeitures, all of which are the prerogatives of the Crown, are franchises. The rights of forest, chase, park, warren, and fishery are also franchises, no subject being entitled so to apply his property for his own convenience. A county palatine (see PALATINATE) is the highest species of franchise; as within it the earl, constable, or other chief officer may exercise without control the highest functions of the sovereign. And as the Crown may thus erect an entire county into an independent jurisdiction, so it may create a liberty of bailiwick independent of the sheriff of the county, and bestow the privilege as a franchise. It is likewise a franchise for a number of persons to be incorporated, and subsist as a body politic, with a power to maintain perpetual succession, and do other corporate acts; and each individual member of such corporation is also said to have a franchise or freedom. The right to hold a fair or market, or to establish a ferry and to levy tolls therein, is also a franchise. Where the holder of a franchise is disturbed in his right he may sue for damages by an action on the case; or in the case of non-payment of tolls he

has the remedy of distress (q.v.). Viewed as property a franchise is an incorporeal hereditament (q.v.), and contains an implied covenant on the part of the Government not to abrogate or invade the right vested by it in the grantee, and on the part of the latter to perform all the duties which it imposes, and to exercise his right and privileges under it in a faithful and reasonable manner. When a franchise is granted on a valuable consideration, as in the case of a private corporation, it is in the nature of a contract between the Government and the grantee, and is protected from legislative interference in this country by constitutional provisions prohibiting the enactment of laws which impair the obligation of contracts. (See DARTMOUTH COLLEGE CASE.) On the other hand, the franchise is affected with a *jus publicus*, which secures to the State the power of regulating the conduct of a corporation, and even of destroying it by way of punishment for any grave abuse of its privileges.

As a political term, franchise denotes the right of suffrage. In England the qualifications of voters for members of Parliament are quite different from those of voters at municipal and other local elections. In this country the conditions of elective franchise are generally, though not always, the same for Federal, State, and municipal purposes. Consult: Pollock and Maitland, *History of English Law* (2d ed., London, 1899); Kent, *Commentaries*; *Encyclopædia of the Laws of England*; Taylor, *Treatise on the Law of Private Corporations* (New York, 1902).

FRANCIA, frān'châ (1450-1518). An Italian painter, goldsmith, and sculptor of the Early Renaissance, whose real name was Francesco di Marco Raibolini. He was the chief master of the early Bolognese School of Painting (q.v.). He was born at Bologna, the son of a carpenter, and until his fortieth year practiced the goldsmith trade. In this he achieved high distinction, having been repeatedly steward of the goldsmiths' guild, and in 1514 steward of the Four Arts. He was famous as a medalist and as a worker in niello. Two charming niello plates at the Academy of Bologna are ascribed to him, as is also a small relief portrait of Giovanni II. Bentivoglio in San Giacomo Maggiore. The ruling house of Bentivoglio named him master of the mint, and upon its expulsion Pope Julius II. confirmed him in this office.

Francia's earliest dated paintings (1490) show the influence of Lorenzo Costa, who was then at Bologna, and who probably taught him painting. The metallic character of his first pictures, and their strong outlines, point to his former profession. But Francia soon outgrew his colleague, both in color and in drawing, although Costa was more imaginative and dramatic. There also appears in his works a sentiment reminiscent of the Umbrian masters.

Among his earlier paintings are a "Madonna," in the Museum of Berlin, and a dead "Saint Stephen," in the Borghese Palace, Rome. The Pinacoteca of Bologna has a fine "Madonna Enthroned," a "Nativity," and a "Dead Christ"; the Brera (Milan), an "Annunciation"; the Louvre, a "Crucifixion, with Job"; Berlin, a "Virgin in Glory" (1502). The "Virgin in a Rose Garden Adoring the Christ-Child," in the Munich Gallery, a picture of highest poetic

charm, and well executed, is probably by him, although Morelli ascribes it to Francia's pupils. Another fine example of his work is the Bentivoglio altarpiece in San Giacomo Maggiore, Bologna.

All of his paintings, though charming in sentiment, lack dramatic action; they are groups of charmingly isolated figures, rather than connected compositions. Nevertheless, in his later works we find a vein of dramatic action, and an increased nobility of form and conception. These are due, to some extent, to the influence of Raphael. The reputed correspondence between Francia and Raphael and Francia's sonnet to the master are forgeries of a later date, but Francia may well have seen works of Raphael at Bologna. Among the works showing the influence of Raphael are the "Virgin Enthroned" in the National Gallery (London); the "Coronation of the Virgin," in the Cathedral of Ferrara; and the "Assumption of the Virgin," in San Frediando, Lucca. Other examples are the "Deposition from the Cross," in the Parma Gallery; the "Adoration of the Kings," at Dresden; and a portrait of an "Unknown Man" attributed to Raphael, in the Lichtenstein Gallery, Vienna. His frescoes in the Oratory of Santa Cecilia, Bologna, representing the "Marriage of the Saint with Saint Valerian" and her "Burial," are among the finest of his works.

Francia was much grieved by the exile of the Bentivogli in 1506. He was patronized by Pope Julius II., and remained at Bologna. His style underwent no change, but his last works show decline. He died at Bologna, January 5, 1518.

Francia's sons, GIACOMO (died 1557) and GIULIO (1487-1543), painted in their father's manner, but were much inferior to him. They worked together, signing their works J. J. Francia, and examples of their joint efforts exist in the Galleries of Bologna, Parma, and Berlin. Giacomo, who was the better painter, subsequently came under the influence of Dosso Dossi (q.v.). Specimens of his independent work are in the Museum of Berlin, the churches and Gallery of Bologna, and in the Brera, Milan.

Consult: Vasari, *Vite dei Pittori*, etc., ed. Milanesi, vol. ii. (Florence, 1878-85); English translation by Blashfield and Hopkins, vol. ii. (New York, 1897); Cartwright, *Mantegna and Francia* (London, 1881); Morelli, *Italian Painters* (London, 1892-93); Woltmann and Woermann, *History of Painting*, vol. ii. (Eng. trans., New York, 1901).

FRANCIA, frän'sé-á, JOSÉ GASPÁR RODRÍGUEZ (1760?-1840). Dictator of Paraguay. He was born at Asunción, and was the son of a small landed proprietor of Portuguese origin. He was intended by his parents for the Church, and took his degree as Doctor of Divinity at the University of Córdoba de Tucumán, but subsequently adopted the profession of law and gained considerable distinction as a jurist and public official. When the revolution against Spain broke out at Buenos Ayres in 1810, Paraguay at first seemed disinclined to favor the Liberal cause, but finally it joined the movement for liberation and in 1811 proclaimed its independence. Francia took a leading part in the revolution, and was made secretary of the Government Junta. He was the one man of ability among an ignorant population and was so hampered by his col-

leagues that he resigned his position, only to come forward into still greater prominence when the incapacity of the governing body had precipitated a counter-revolution. In 1813 he was appointed joint consul with General Yegros. The latter was a man of little intellect and energy, and Francia was, in fact, sole ruler from the first. In 1814 he was made dictator for three years, and in 1817 the dictatorship was given him for life. Under Francia's despotic sway, which was at times that of a bloody tyrant, the condition of Paraguay rapidly improved. The extraordinary system of non-intercourse with other nations which he enforced benefited Paraguay in diversifying her industries and forcing her farmers to develop the resources of the soil to the utmost in order to supply the home market. Francia introduced schools, repressed superstitious observances, and enforced strict justice in the courts, but he kept his subjects in a state of cruel bondage and lived in perpetual fear of assassination. Rengger and Longchamp, two Swiss surgeons whom Francia held as prisoners from 1819 to 1825, gave an account of the dictator in their *Essai historique sur la révolution de Paraguay et le gouvernement dictatorial du docteur Francia* (Paris, 1827). Consult also the works of J. P. and W. P. Robertson: *Letters on Paraguay* (London, 1838); *Francia's Reign of Terror* (London, 1839); *Letters on South America* (London, 1843).

FRANCIABIGIO, frän'shá-bé'jò (an abbreviation of Francesco di Cristofano Bigi (1482-1525). A Florentine painter, of the High Renaissance. He was a pupil of Albertinelli (q.v.), but was influenced to a far greater extent by Andrea del Sarto, with whom he lived and worked. Among the works of his early period, showing the influence of Albertinelli, are the "Virgin with Job and Saint John," and "Calumny," after Lucian's description of a picture by Apelles, both in the Uffizi (Florence); the "Madonna del Pozzo," in the same gallery, usually ascribed to Raphael, has also been attributed to him. He assisted Andrea del Sarto in most of his frescoes. Among their joint works was a series representing the "Life of the Virgin," in the Convent of the Servites, Florence. One of this series, the "Marriage of the Virgin," is Franciabigio's best work, although mutilated by the artist himself, who was enraged at its premature unveiling by the friars. Of the series of frescoes of the "Life of John the Baptist," in the Convent dello Scalzo, he executed two: "Departure of John for the Desert," and "Meeting of John and Jesus." Among his other canvases are the "Temple of Hercules," in the Uffizi, and the "Story of Bathsheba" (1523), at Dresden. They are of marked individuality and fine color, and excellently modeled. The best known are portraits of young men. There is a fine specimen in the Pitti Palace, and another, perhaps of himself, in the Palazzo Capponi, Florence. Others are in the Berlin Museum (1532) and the National Gallery, London; the one at Windsor Castle is usually ascribed to Andrea del Sarto.

FRANCILLON, frän'sé'yón'. The title of a play by the younger Dumas. It belongs to the most lively and rapid of his comedies.

FRAN'CILLON, ROBERT EDWARD (1841-). An English journalist and novelist. He was born at Gloucester, England, March 25, 1841, was edu-

cated at Trinity Hall, Cambridge, and was admitted to the bar in 1864. From 1872 to 1894 he was on the staff of the *London Globe*. His first novel, *Grace Owen's Engagement*, appeared in *Blackwood's Magazine* in 1868. Among his many other novels are *Olympia* (1874), and *A Dog and His Shadow* (1876). He has also written songs and poems.

FRAN'CIS. (1) A friar in Shakespeare's *Much Ado About Nothing*. (2) A 'drawer' at the Boar's Head Tavern, Eastcheap, in Shakespeare's *Henry IV., Part I.*, whom Prince Hal and Poins plague by both calling him at the same time "till his tale was nothing but—Anon."

FRANCIS I. (1708-65). Holy Roman Emperor from 1745 to 1765. He was the son of Leopold, Duke of Lorraine, and in 1729 succeeded his father in the duchy. In 1735 he ceded Lorraine to Stanislaus Leszczynski, father-in-law of Louis XV., to revert after his death to the Crown of France, obtaining in return the succession to the Grand Duchy of Tuscany, whose native rulers, the Medicean family, were about to die out. In 1736 he married Maria Theresa of Austria, the only daughter and heiress of the Emperor Charles VI., and in the following year became Grand Duke of Tuscany. In 1740 Charles VI. died, and Maria Theresa succeeded him as ruler of the Austrian possessions. She made her husband co-regent with herself, but gave him little share in the administration. In the wars carried on against Frederick the Great Francis took little personal share. In 1745 he was elected Holy Roman Emperor and was crowned at Frankfort, October 4th. The Famous Seven Years' War (1756-63) now broke out between Austria and Prussia, but the cares which it imposed fell mainly upon the great-hearted Maria Theresa, while Francis chiefly concerned himself with amassing a huge private fortune. He died August 18, 1765, at Innsbruck. His son Joseph succeeded him in the Imperial dignity, but Maria Theresa retained in her hands the sovereignty of the Austrian dominions till her death (1780). Consult: Seyfart, *Leben Franz' I.* (Nuremberg, 1766); Arneth, *Geschichte Maria Theresias* (Vienna, 1863-79).

FRANCIS II. (1768-1835). Holy Roman Emperor from 1792 to 1806, and ruler of the Austrian dominions from 1792 to 1835 (with the title of Emperor of Austria from 1804). He was the eldest son of the Emperor Leopold II., and of Maria Louisa, daughter of Charles III., King of Spain, and was born at Florence, February 12, 1768. In 1790 his father, previously Grand Duke of Tuscany, became Emperor on the death of his brother Joseph, and on his death, March 1, 1792, was succeeded in the hereditary Austrian dominions by Francis, who, in July, was elected to the Imperial throne of Germany. His reign began at a time when the progress of the French Revolution was exciting the alarm of the Old European dynasties. Austria was in alliance with Prussia against the Republic, and the allied armies invaded France, but were driven back. In 1794 the French arms carried all before them in Belgium. In 1795-96 the war between France and Austria raged fiercely on German soil. In 1796 Bonaparte swept through northern Italy and in 1797 Austria was invaded. Francis was forced to conclude the Treaty of Campo Formio October 17, 1797, by

which Austria surrendered Belgium and Lombardy, receiving in return most of the dominions of the extinguished Republic of Venice. Two years afterwards Francis, in alliance with Russia and England, again took up arms, and was at first successful; but the recall of the Russian general, Suvaroff, and the return of Bonaparte from the East turned the tide. The victories won by Bonaparte at Marengo and by Moreau at Hohenlinden broke the power of Austria, and Francis was compelled to sue for peace. By the Treaty of Lunéville in 1801, France was confirmed in the possession of the left bank of the Rhine. In 1804 Francis assumed the title of Emperor of Austria. In 1805 he entered into a new alliance with Russia; but the contest with France ended more disastrously than ever for the Austrians. The French victory at Austerlitz completely humiliated Francis, who, at the Peace of Pressburg, in December, 1805, was obliged to surrender the Venetian territories and Tyrol. The Holy Roman Empire was now dissolved, after lasting for a thousand years, and Francis was henceforth known as Emperor of Austria and King of Bohemia and Hungary. In 1809 he recommenced the war with Napoleon. The battle of Aspern or Essling was an Austrian victory, though not a decisive one, but Napoleon triumphed again at Wagram, and dictated terms of peace from the Palace of Schönbrunn in October of the same year, wresting from the Hapsburgs a large portion of their ancient hereditary territories, out of which the conqueror created the dominion of the Illyrian Provinces. In 1810 the French Emperor married the daughter of Francis, Maria Louisa. A permanent friendly alliance now seemed to be concluded between the two empires; and during the Russian campaign of 1812 the Austrians rendered the French some slight assistance. After the destruction of the French army of invasion in Russia, Francis, who had exerted himself fruitlessly to mediate between France and Russia, suddenly joined the allies, helped to win the battle of Leipzig, and with the Russians and Prussians advanced to Paris in 1814. Immediately after the first abdication of Napoleon the Congress of Vienna was assembled for the reconstruction of the political system of Europe. (See AUSTRIA-HUNGARY.) Francis joined Alexander I. of Russia and Frederick William III. of Prussia in the formation of the Holy Alliance (q.v.), and the reactionary and absolutistic ideas embodied in that contract characterized the policy during the remainder of his reign. Its guiding spirit and his constant counselor was Metternich (q.v.). Francis died on March 2, 1835. Consult Meynert, *Franz I.* (Vienna, 1871-73).

FRANCIS I. (1494-1547). King of France 1515 to 1547. He was the son of Charles, Count of Angoulême, and was born at Cognac, September 12, 1494. In his youth he received a thorough military training consistent with his rank and position. At the age of twenty he married Claude, daughter of Louis XII., and succeeded his father-in-law January 1, 1515. He immediately entered upon the task of reconquering Milan, which had been wrested from his predecessor two years before. At the head of 40,000 men Francis crossed the Alps and attacked the Swiss allies of the Milanese at Marignano, completely defeating them with a loss of 12,000 men, September 13

and 14, 1515. On the field of battle Francis accepted knighthood from the renowned Bayard. After some further successes he returned to Paris in 1516. On the death of the German Emperor Maximilian in January, 1519, Francis I. and Charles of Spain became rival candidates for the Imperial crown. The election of Charles excited the anger of the French King, who immediately prepared for war, and endeavored to secure the alliance of Henry VIII. of England, but with no success, Henry instead forming an alliance with the Pope and the Emperor against Francis. The forces of Francis I. were driven out of Italy; the English and Imperialists invaded France; the Constable de Bourbon, who was discovered to be conspiring against his sovereign, fled to Charles, who gladly accepted his services. An attempted invasion of Italy by the French failed, and the Imperialists advanced into Provence. On the approach of the French King they withdrew into Italy, where they were followed by Francis, who overran Lombardy, but was totally defeated and taken prisoner at the battle of Pavia, February 24, 1525. Charles carried his captive to Madrid, and only granted him his liberty on the hardest conditions. He was forced to renounce the sovereignty of Flanders and Artois, the Duchy of Burgundy, and all his Italian possessions; to promise the restoration of the Constable de Bourbon to his former dignities; and to surrender his two sons as hostages. Francis obtained his freedom March 17, 1526; but his first act, on his return to his dominions, was a refusal to fulfill the pledges he had given. Pope Clement VII. absolved him from his oath; England, Rome, Venice, Florence, and Genoa—all of whom were growing alarmed at the immense power of Charles—withdrew from the Imperial alliance and sided with his antagonist. The war in Italy now recommenced. On May 6, 1527, the Imperial forces of the Constable de Bourbon stormed and sacked Rome and captured the Pope. A French army under Lautrec was sent into Naples, but after a series of brilliant successes was almost wholly cut off by disease. About the same time Francis sent a challenge to Charles to decide their quarrel by single combat. The challenge was accepted, but the duel never took place. Peace was concluded at Cambrai in August, 1529, to the great advantage of the Spaniards. In 1536, however, war broke out again between the French and the Emperor, the French having overrun Savoy, to which Francis laid claim, and whose Duke was the ally of Charles V. Little definite result ensued, but the war was marked by an alliance between Francis and the Turks. Finally, by the efforts of Pope Paul III., a truce was concluded for ten years at Nice, between Charles and Francis, June 18, 1538. In point of fact, however, peace lasted only four years, and in 1542 the French King put into the field five different armies against the Emperor, who had just been repulsed by the Moors of Algiers. The battle of Ceresole, April 14, 1544, in which the French were completely victorious, partially wiped out the dishonor of the defeat at Pavia, but a second alliance with the Turks renewed the indignation of the Christian powers. Charles V. and Henry VIII. of England marched upon Paris, and Francis was compelled to make peace with the Emperor at Crespy, September 18, 1544. The war with England continued till 1546. Francis died at Rambouillet, March 31, 1547. Gay

and voluptuous, Francis was still capable of heroic impulses and acts of splendid generosity. He was a generous patron of the artists of the Renaissance, several of whom were to be found at the French Court. Libraries, schools, and colleges were founded and learning encouraged. His persecution of the Vaudois and other Protestant sects, however, has left a dark stain on his memory.

BIBLIOGRAPHY. Consult the general histories of Michelet, Martin, and Ranke, all of which give a good account of the reign of Francis I. There is no good single work on his reign, the most complete, Gaillard, *Histoire de François I.* (Paris, 1769), being out of date. Of existing works in French the best are: Paris, *Etudes sur François Ier* (Paris, 1885), a work dealing largely with the social life of the times; Mignet, *Résumé de François Ier et Charles Quint* (Paris, 1876); Capefigue, *François Ier et la renaissance* (Paris, 1844). In English a popular account will be found in Pardoe, *The Court and Reign of Francis I.* (London, 1849, and later editions); Cochrane, *Francis I. and Other Historic Studies* (London, 1870); Coignet, *Francis I. and His Times*, translated by Twemlow (London, 1889).

FRANCIS II. (1544-60). King of France from 1559 to 1600. He was the eldest son of Henry II. and Catharine de' Medici, and ascended the throne in his sixteenth year. Weak in mind and body, he was merely a tool in the hands of the Duke of Guise and the Cardinal of Lorraine, whose ambition brought on the disastrous civil wars. But for his marriage (1558) with Mary Stuart, a niece of the powerful Guises, Francis II. would now scarcely be remembered. Consult De la Barre-Duparcq, *Histoire de François II.* (Paris, 1867).

FRANCIS I. (1777-1830). King of the Two Sicilies from 1825 to 1830. He was the son of Ferdinand I. and became heir to the throne in 1778. In 1812 he was appointed Regent of Sicily by his father, and proclaimed a constitutional government, but in the following year his father deposed him, and dissolved the Parliament. In 1816 Francis became Governor of Sicily, and in 1820 Regent of Naples. In 1825, on the death of his father, he ascended the throne. The character of liberal ruler which he had previously assumed immediately disappeared; and his reign was marked by corruption, cruelty, and subserviency to Austria. Consult Nisco, *Napoli sotto Francesco I.* (Naples, 1887).

FRANCIS II. (1836-94). King of the Two Sicilies from 1859 to 1861. He was the son of Ferdinand II., and followed his father's system in ruling with an iron hand. In keeping with his rigorous policy of absolutism, he refused all liberal concessions in spite of the urgent demands of the powers. When all Sicily, with the exception of Messina, had submitted to Garibaldi, in the summer of 1860, he sought to pacify his people by the promise of manifold reforms, and failing to secure their good will, made strong but unsuccessful efforts to secure foreign intervention in his behalf. After Garibaldi's entrance into Naples September, 1860, the King fled to Capua, and thence to the citadel at Gaeta. After a short siege, Gaeta surrendered, and the King took refuge on a French frigate February 13, 1861. His dominions were incorporated in the Kingdom of

Italy, and he selected Rome as his place of residence. Consult Nisco, *Francesco II., re.* (Naples, 1891). See GARIBALDI; ITALY.

FRANCIS JOSEPH I. (1830—). Emperor of Austria. He was born August 18, 1830, at Vienna, the eldest son of Archduke Francis and a nephew of Ferdinand I., Emperor from 1835 to 1848. Francis was taught the various languages of the heterogeneous Austrian monarchy. In 1848 he served under Radetzky in Italy. On December 2, 1848, amid the convulsions which threatened the dissolution of the Empire, the weak Emperor Ferdinand abdicated, his brother, the Archduke Francis, gave up his claims to the crown, and Francis Joseph, whose youth and popularity it was believed would make it easier to harmonize the conflicting interests of the monarchy, mounted the Austrian throne. Hungary was now in a state of open revolt, and in April, 1849, declared itself a republic with Kossuth as Governor. In Italy Charles Albert of Sardinia again took up arms against Austria. Both in Hungary and Italy Austria triumphed, and the Emperor devoted himself to the reestablishment of his authority. (See AUSTRIA-HUNGARY.) In 1853 an attempt on his life was made by an Hungarian, but the Emperor escaped with a slight wound. In 1855 a concordat was concluded with Pius IX., which restored to the Roman Catholic Church throughout the Empire many of the liberties of which it had been deprived since the hostile reign of the Emperor Joseph II. In 1859 Francis Joseph was called to face a war with France and Sardinia, which ended with the loss of Lombardy. After this war Francis Joseph abandoned his conservative policy, and began the necessary work of reform, and after the disastrous Seven Weeks' War (q.v.) with Prussia, a reconstruction of the monarchy on a dualistic basis was effected by the *Ausgleich* of 1867. The abrogation in 1870 of the concordat of 1855 antagonized the Pope. Francis Joseph has since striven to maintain a constitutional and parliamentary régime in his dominions. He enjoys the respect and affection of his subjects, and it is his personal influence that really holds his dominions together under the most discouraging political conditions. During his reign the Austro-Hungarian monarchy has experienced a great industrial development. Francis Joseph married, April 24, 1854, Elizabeth, daughter of Duke Maximilian of Bavaria, who was assassinated by an Italian anarchist in Geneva September 10, 1898. The Emperor's only son, Rudolph, died a violent death in January, 1889. The present heir presumptive is the nephew of Francis Joseph, Francis Ferdinand. See AUSTRIA-HUNGARY.

FRANCIS, CONVERS (1795-1863). An American Unitarian clergyman and writer. He was born at West Cambridge, Mass., graduated at Harvard, and became a Unitarian minister at Watertown. Lydia Maria Child, the philanthropist, was his sister. Dr. Francis was made professor of pulpit eloquence in Harvard University. He wrote a *Life of Rev. John Eliot, the Apostle to the Indians* (1836), for Sparks's "Library of American Biography," and a *Life of Sebastian Rale* (1848), the Jesuit missionary, as well as memoirs of other celebrated men. Consult Newell, "Memoirs of Convers Francis," in *Massachusetts Historical Society's Proceedings* (Boston, 1864-65).

FRANCIS, JAMES BICHENO (1815-92). An American hydraulic engineer. He was born at Southleigh, England, and came to America at the age of sixteen. From 1837 to 1884 he was chief engineer of locks and canals on the Merrimac River, and in this connection his numerous investigations and experiments in hydraulic engineering have attracted wide attention. His scientific papers have been published chiefly in *Lowell Hydraulic Experiments*, (3d ed. 1883), and he also wrote *The Strength of Cast-iron Columns* (1865).

FRANCIS, JOHN WAKEFIELD (1789-1861). An American physician of German and Swiss descent, born in New York. He was graduated from Columbia College in 1809, and received the degree of M.D. from the College of Physicians and Surgeons, New York City, in 1811. He was professor of obstetrics and of medical jurisprudence in Rutgers Medical College, New York City, from 1826 to 1830; professor of materia medica in the College of Physicians and Surgeons from 1813 to 1816; professor of the institutes of medicine from 1816 to 1820; and professor of obstetrics from 1820 to 1826. He was one of the most active members of the New York Historical Society, and used his influence to promote the study of natural history and the fine arts. He interested himself greatly in the Woman's Hospital, the State Inebriate Asylum, and kindred institutions. With Dr. David Hosack he published the *American Medical and Philosophical Register* (1810-14). Among his many works were: *Use of Mercury* (1811); *Cases of Morbid Anatomy* (1814); *Febrile Contagion* (1816); *On Cholera Asphyxia* (1832); *Anatomy of Drunkenness* (1857); *Memoir of Christopher Colles*; and *Old New York, or Reminiscences of the Past Sixty Years*.

FRANCIS, SIR PHILIP (1740-1818). An English epistolary writer, the reputed author of the *Letters of Junius*. The son of Rev. Philip Francis, he was born in Dublin, and was educated at Saint Paul's School, London, where he had for a school-fellow Henry S. Woodfall, afterwards editor and printer of the *Public Advertiser* and publisher of the *Letters of Junius*. In 1756 he obtained a place in the office of Henry Fox, then Secretary of State. In 1758 he became secretary to General Bligh, whom he accompanied on the expedition against Cherbourg; in 1760 secretary to the Earl of Linnoul, Ambassador to Portugal; in 1761 amanuensis to Pitt; and in 1762 first clerk in the War Office. In 1773 he was appointed a member of the Council of Bengal, with a salary of £10,000, and sailed for India the next year. He quarreled with Warren Hastings, by whom he was severely wounded in a duel. Returning to England in 1781, he entered Parliament three years later, and took an active part in the impeachment of Hastings. He never gained a reputation as an orator, but his great abilities and extensive information always commanded the respect and attention of the House. In his political opinions he was a decided and consistent Whig. He withdrew from Parliament in 1807. None of his acknowledged writings, consisting mostly of political pamphlets, are of permanent value. There is considerable evidence to prove that he was the author of the *Letters of Junius* (q.v.). Consult Parkes and Merivale, *Memoirs of Sir Philip Francis* (London, 1867).

FRANCIS/CA. A nun in the convent of which Isabella is a novice in Shakespeare's *Measure for Measure*.

FRANCISCANS, ORDER OF (also called Minors or Lesser Brethren), a religious Order of the Catholic Church, founded by Saint Francis of Assisi in 1209. For an account of the establishment of the Order and its earliest years, see **FRANCIS OF ASSISI, SAINT**. The rule drawn up by Saint Francis in 1209 was divided into twenty-three chapters, containing twenty-seven precepts, which were afterwards rendered obligatory by the Popes under pain of mortal sin. The use of money is absolutely forbidden, and the quantity, quality, and value of the clothing are prescribed. The habit was to consist of a gray gown of coarse cloth, with a pointed head or capuche, an under-tunic and drawers, and a cord around the waist. This costume resembled the dress of the shepherds of the day. The use of shoes and riding on horseback were prohibited. Conversations with women and the visiting of female monasteries were forbidden. Fasts on all Fridays of the year were enjoined, as also during the periods from All-Saints to Christmas and from Epiphany to Easter. The recitation of the Divine Office was also rendered obligatory. Absolute obedience to superiors in all things not contrary to the rule was prescribed. The Order grew rapidly and spread throughout the various countries of Europe, until at the second general chapter, held at Assisi in 1219, within ten years of its birth, more than five thousand brethren were present. In less than half a century it reckoned some 33 provinces, in which there were over 8000 convents, with a membership of 200,000. Some idea of the extraordinary extension of this remarkable institute may be formed from the startling fact that, in the dreadful plague of the black death in the following century, no fewer than 124,000 Franciscans fell victims to their zeal for the care of the sick and for the spiritual ministration of the dying. After the death of Saint Francis a modification of the rule was introduced by Brother Elias, his successor in the office of general of the Order. This innovation related to the interpretation of the nature and extent of the vow of religious poverty, whether the community could acquire the privilege of the right of property even in things of necessary use. Those who adhered to the letter of the rule denied the privilege of all right of property to the community, and contended that it was unlawful for the Order to acquire or retain a right of property in houses, convents, or even churches, restricting its right in everything which it possessed to the simple use. Out of this controversy arose divisions and subdivisions in the Order. The first broad distinction to which it gave rise was that between the Conventuals and the Observantines, the former living according to a mitigated interpretation of the rule and holding to the community's right of property, while they strictly adhered to the vow of poverty on the part of the individual; the Observantines, following the more rigid interpretation of the rule, deny the right of property in the Order and live more in the manner of hermits, in low, mean dwellings, and according to the original rigor of the institute. The latter are called Friars Minor of the Strict Observance. In the course of time there arose among the Observantines themselves sev-

eral reform movements, which gave rise to three branches; that of Saint Bernardino of Siena in 1419, called the Reformed; then that of Blessed John de la Puebla, and Blessed John of Guadalupe, under the name of Recollets in 1500; and finally the reform of Saint Peter of Alcantara in 1555, known under the name of Alcantarines. But all three branches are subject to the one minister-general at Rome, and all are discalced or barefooted friars. Several popes attempted to reconcile the differences between the Conventuals and the Observantines without avail. Finally, in 1517, Leo X. officially recognized the distinction between them, and in a bull promulgated that year gave the name of Conventuals to those who persisted in following the mitigated rule and in holding to the community's right of property. Each body had its own general, but the minister-general of the Observantines enjoyed preëminence and authority over the general of the Conventuals, who was obliged to obtain his confirmation from the former. During the Pontificate of Sixtus V. the Conventuals sought in vain to free their head from this subordination, and renewed the attempt in 1594 under Clement VIII. with no greater success. When they renewed their claim again under Urban VIII. the latter imposed silence upon them by a brief of April 21, 1631.

The entire Franciscan body consists of three main groups, respectively called the first, second, and third Orders. To the first Order belong the male members of the different observances, who bind themselves by solemn vows; the second Order consists of the female religious, the Poor Clares, Urbanists, and Capuchin nuns; the tertiaries, or third Order, comprise both lay persons and certain religious congregations affiliated to the Order of Franciscans. (See **TERTIARY**.) An immense number of persons desirous of practicing in the world the virtues of the cloister joined the third Order, from the humblest to the highest station in life; notably among the latter in the thirteenth century were Saint Louis of France and Saint Elizabeth of Hungary. In the course of time some tertiaries desirous of living in community, while conforming to the rules of the third Order, formed communities in many parts of Europe which were affiliated with the general body as a branch distinct from the first and second Orders.

The head of the entire Franciscan body is chosen alternately from the Cismontane and the Ultramontane families, a geographical division, the latter being those religious whose convents are situated in France, Spain, Lower Germany, Saxony, the islands of the Mediterranean, Africa, Asia, and the Indies in general; the former those in Italy, Upper Germany, Hungary, Poland, Syria, and Palestine. Each family is again divided into provinces, vicariates, or custodies. Several custodies constitute a province under a common superior appointed by the general. Some custodies are subject to a provincial, while others depend immediately upon the general. The superior of the entire Order bears the title of Minister-General of the Order of Saint Francis, and to his jurisdiction the Poor Clares and the Urbanist nuns are also subject. The general of the Conventuals is called Master-General of the Friars Minor Conventuals; the general of the Capuchins, an offshoot of the Franciscans, founded by Matteo di Bassi in 1526, is called Minister-

General of the Friars Minor Capuchins. The third Order has also a general of its own. The Order has given five Popes to the Church: Nicholas IV., Alexander V., Sixtus II., Sixtus V., and Clement XIV., besides fifty-four cardinals, beginning with Saint Bonaventure. It has given some celebrated theologians and philosophers to the ranks of the schoolmen; Saint Bonaventure, Duns Scotus, Alexander of Hales, William of Occam. Roger Bacon, famous as the experimental philosopher of the Middle Ages, was a Franciscan friar. The great Spanish statesman Cardinal Ximenes, two centuries later was also a follower of Saint Francis. Its historian, Father Luke Wadding, who published his elaborate *Annals* of the Order in the seventeenth century, bears a deservedly high reputation. In lighter literature, and especially poetry, Saint Francis himself is notable as a sacred poet. Jacopone da Todi, the author of the "Stabat Mater," is one of the most celebrated mediæval hymn-writers; Lope de Vega, the Spanish dramatist, closed his eventful career as a member of the third Order. Dante, it is believed from a passage in the *Divina Commedia*, was a Franciscan tertiary. In the revival of art the Franciscan Order bore an active and enlightened part. They may be said to have been the inspiring influence which gave rise in painting to the mystical School of Umbria, which in Perugino and Raphael attained the ultimate reach of Christian art. Giotto and his successors, especially in fresco painting, were profoundly influenced by the Franciscan spirit. In architecture the same spirit was potent in creating new types of churches in line with Cistercian models. The Franciscans may be said to have imported into art a sentiment which, before them, had existed only in a crude state—seraphic love. Their idealism and religious fervor did more perhaps than any other factor to exalt and spiritualize the art of the Middle Ages up to the time of the Renaissance.

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FRANCIS DE SALES, *Fr. pron. frän'sis'* de säll, SAINT (1567-1622). A distinguished saint and writer of the Catholic Church. He was of noble descent, and was born at the Château de Sales, the seat of his family in Savoy. He was the eldest son, and his father bestowed unusual care upon his education with the idea of fitting him for a worldly career in keeping with his station in life.

After spending his earlier years at the Collège de la Roche and the College of Annecy, in the neighborhood of his home, he became a pupil, at thirteen years of age, of the Collège Clermont at Paris under the direction of the Jesuit Fathers. In 1584 he entered the University of Padua, where, at twenty-four, he took his final degree with great distinction and became a Doctor of Laws. But his inclination was for the Church rather than for law. His father at first opposed his wish to enter the priesthood, but in the end gave his consent. Upon his ordination he was appointed provost of the diocesan chapter at the request of Monseigneur de Granier, Bishop of Geneva. In 1594 the young priest was sent to the difficult mission of the Chablais, a province of Savoy, which had become Calvinistic. His efforts for a long time proved fruitless; but in time he saw his labors repaid with numerous conversions, before his departure witnessing the restitution of all churches and of all ecclesiastical property in the Chablais to the diocesan clergy. Shortly after his return from the apostolate of the Chablais, at the solicitation of Monseigneur de Granier, Francis was made coadjutor bishop with the right of succession to the See of Geneva; and his succession followed in 1602. In that year the interests of the French division of the Geneva diocese took Francis to Paris. Here Henry IV. conceived a cordial liking for him. As Bishop of Geneva Francis was as indefatigable in his apostolic labors as when he was a simple priest. His preaching was simple, fervid, and direct. He carefully avoided the turgid ornament and rhetorical affectations common to the sermons of his century. As a writer Saint Francis de Sales has attained a wide popularity. His *Introduction to the Devout Life* has been translated into almost every language of Europe, and has been more widely read than any other work on devotion with the exception of the *Imitation of Christ*. His *Treatise on the Love of God* is his chief doctrinal work, and shows more fully the comprehensive character of his mind. His style is simple, lucid, and profusely illustrated. It was under the spiritual direction of Saint Francis de Sales that Sainte Jeanne de Chantal (see CHANTAL, JEANNE FRANÇOISE DE) founded the Congregation of the Visitation of the Virgin Mary in 1610. Saint Francis died at Lyons, on September 28, 1622. In 1665 he was solemnly canonized by Pope Alexander VII., and in 1877 he was declared one of the Doctors of the Church. His complete works were published in Paris, 1861-62. The *Love of God* has been edited by Strowsky (Paris, 1901; Eng. trans., London, 1902). For his life, consult: C. A. de Sales (Chambéry, 1860); Camus (London, 1880); Lear (London, 1882); also Guillot, *François de Sales et les protestants* (Geneva, 1873).

FRANCIS OF ASSISI, *frän'sé-zé*, SAINT (1182-1226). The founder of the Order of the Friars Minor, or Franciscans. He was born in the little town of Assisi, Italy. His father was a rich merchant by the name of Pietro Bernardone; his mother, Pica, of the noble family of the Bourlemonts of Provence, a woman of piety and character. The child's baptismal name was Giovanni (John); but his father, out of his predilection for France, with which he carried on an exten-

sive trade, gave the boy the surname of Francisco (the Frenchman), which history has consecrated. Francis was taken into business partnership at the age of fourteen by his father. In his twenty-fourth year, after much meditation and pondering on the course of life he had been leading, he suddenly abandoned his old friends and haunts, and embraced a life of rigid penance and utter poverty. His object was to lead a life as nearly modeled upon that of Christ as possible, and by absolute renunciation of the world to attain evangelical perfection. Retiring to a grotto near Assisi, he gave himself up to penance and profound meditation on the sufferings of Christ. His austerities and his simple eloquence attracted attention, and it was not long before others, awakened by his ardent example, sought to follow in his steps and join themselves to him in his austere mode of life. His first companions were fellow townsmen, Bernard of Quintavalle, a rich and noble layman, and Peter of Catana, a canon of the cathedral. Here was the nucleus of the Franciscan Order. It was not the intention of Saint Francis in the beginning to found a new Order. But others associating themselves with the three companions, until there were twelve all told in the band, and asking for a rule of life, Saint Francis drew up a rule in twenty-three chapters, which, besides the three ordinary vows, of poverty, obedience, and chastity, prescribed the express and absolute renunciation of every possession and the engagement to live upon alms. As soon as the rule was drawn up (probably toward the close of June, or early in July, 1209), all betook themselves to Rome to seek the approval of the Pope. Innocent III., then Pope, after some hesitation, approved the rule by word of mouth, made Francis superior-general of the Friars Minor, and conferred the diaconate on the founder, for Francis was as yet only a layman, and always, from motives of humility, refused to become a priest. On their return to Assisi the Friars Minor established themselves in a little house adjoining the Chapel of Saint Mary of the Angels. During the following two years the brethren occupied themselves with preaching and exhorting the people throughout the rural district around Assisi. The Order now grew rapidly, and in 1216 was solemnly approved by Innocent III. Francis now sent missionary bands into the different provinces of Italy; then into France, Spain, and even Africa, to preach to the Moors. He himself set the example of the missionary work of the Order by going into the East. Two years before his death Saint Francis, while in an ecstasy of prayer, is said to have received the marks (stigmata) of the wounds of Jesus upon his own person. (See STIGMATIZATION.) The scene of this event is laid on Monte Alverno, a lonely mountain near Assisi, and the date September 14, 1224. Saint Francis died at Assisi, October 3, 1226. He was canonized by Pope Gregory IX., in 1228.

The works of Saint Francis have been frequently printed, by Horoy (Paris, 1880), in Latin; better by B. da Fivizzano (Florence, 1880), Latin with Italian translation. Consult the biographies written by Paul Sabatier (Paris, 1894; Eng. trans. by Houghton, New York, 1894); Prudeniano (Naples, 1896); Knox-Little (London, 1897); Oesterly (London, 1901); and

Christen (Innsbruck, 1902). Consult also: Brother Leo of Assisi, *Saint Francis of Assisi, the Mirror of Perfection*, edited by Paul Sabatier, translated by Sebastian Evans (London, 1899); Duff Gordon, *The Story of Assisi* (London, 1901); *Acta Beati Francisci et Sociorum Ejus* (Saint Louis, 1902), edited by Sabatier; Barine, *S. François d'Assise et la légende de ses trois compagnons* (Paris, 1901); Carmichael, *The Lady of Poverty: A Thirteenth Century Allegory* (New York, 1902).

FRANCIS OF PAOLA, pou'la, SAINT (1416-1507). Founder of the Order of Minimites. He was born in Calabria. At an early age he gave himself to a hermit's life, following the example of Saint Francis of Assisi, having no bed but bare rocks, and no other food than the herbs which he gathered in the neighboring woods, or which were brought to him by his friends. He was joined by some other enthusiasts, and the building of a chapel in 1436 is generally considered as marking the beginning of the Minimize Order. (See MINIMITES.) In 1474 the Order was definitely confirmed by the Pope, and Francis appointed its first superior. During the following years several new convents were founded in Calabria and Sicily, and the fame of Francis for sanctity and miraculous powers increased daily. When Louis XI. of France was alarmed by the approach of death, he sent to beg the intercession of Francis, who was unwilling to go to France until he was commanded by Sixtus IV. He visited the King at Plessis-les-Tours and prepared him for death, holding him in his arms when it came. Louis's son, Charles VIII., also had a great respect for him, and built him a cloister in the park of Plessis and another at Amboise. He completed his rule in 1493, in three parts, for the brothers, sisters, and tertiaryaries. He died at the Convent of Plessis in 1507, and was canonized by Leo X. in 1519.

FRANCIS XAVIER, SAINT (1506-52). A celebrated Jesuit missionary, called, from the scene of his mission labors, 'the Apostle of the Indies.' He was the youngest son of one of the most distinguished families of Navarre, and was born near Pamplona, in that kingdom, April 7, 1506. His early education was received at home, and in 1524 he was sent to the College of Saint Barbe, in Paris, where he pursued studies in philosophy with so much distinction that at the age of twenty-four he became a lecturer in philosophy in the Collège Beauvais, at that time one of the most important in the university. He attracted the attention of Ignatius Loyola, then an obscure student at the university, but already taken with the prospect of founding the Society of Jesus. Ignatius, on the lookout for suitable associates, became a close friend of Xavier's. The young professor's mind was intent on university distinction; but, realizing the vanity of his ambitions, he became one of the first members of the Order that his Spanish compatriot was about to found. During Xavier's work in Rome, John III. of Portugal, anxious to extend the influence of Christianity to his immense Indian possessions, made a formal demand of the Pope for missionaries, and asked especially for members of the new Order. Ignatius selected Bobadilla; but illness prevented his setting out, so Xavier was substituted for him, and after a single day for prepa-

ration began his journey to Lisbon. At Lisbon, during the preparations for the voyage, he accomplished so much good that the King wanted to retain him at his capital. But Xavier's heart was now bound up in the mission to India, and he sailed from Lisbon, April 7, 1541. He wintered at Mozambique, and did not arrive in Goa until May 6, 1542.

He found the lives of the European Christians in India so scandalous that it was useless to preach to the natives with such a perverse example under their eyes. Accordingly, he first took up the reformation of the foreign townspeople, and succeeded in awakening a spirit of exemplary penance and religious fervor. Then he began his labors among the natives by preaching among the pearl-fishing population of the coast from Comorin to the island of Manar. After a little more than a year he returned to Goa, whence, with a fresh staff of assistants, he visited the Kingdom of Travancore. In the space of a single month here he baptized ten thousand natives. Thence he passed to Malacca, where three other Jesuit missionaries, sent by Ignatius in compliance with Xavier's earnest solicitations, joined him. His success among the dwellers on the coast region proved so encouraging that in 1546 he proceeded to the Banda Islands, to Amboyna, and the Moluccas. Having effected an establishment of the Gospel in many places, he now retraced his steps and revisited the scenes of his missionary labors. His care in the selection and instruction of native catechists was proved by the excellent state of the missions. He had a supreme faculty for organization; hence he succeeded not only in making large numbers of converts, but in forming them into communities with inherent vitality.

After this he crossed to the island of Ceylon, where he converted the King of Kandy, with many of his people. In May, 1548, he returned to Goa, to prepare for the conversion of the Japanese Empire. A distinguished Japanese convert became a valuable auxiliary, and by his aid Xavier was enabled to acquire enough of the Japanese language to translate and explain the Apostles' Creed in it. His first success was insignificant, but before long the usual blessing attended his labors. The mission founded by him at Miako continued to flourish for more than a hundred years, until the final expulsion of Christianity from the Japanese Empire. After two years and a half in Japan, he resolved to organize a mission to China. At Malacca he tried to arrange with the Governor that an embassy should be sent in the name of the King of Portugal to China, by the help of which he hoped to gain an entrance for his mission. He was not able to effect this, however. Accordingly, he took passage in a merchant ship to the island of Sancian, near Macao, which was at that time the trading port of the Chinese with merchants from Portugal. Here, having obtained a Chinese interpreter, he hoped to induce some native merchants to land him secretly on the coast. His plan was baffled by the fears of the Portuguese, who dreaded that the Chinese authorities would punish this infraction of the law.

Xavier's disappointment was keen. For years his heroic zeal had tempted him to labors beyond his strength, and his sublime charity had exposed him to privations which had undermined

his constitution. He fell ill of fever, for which his attendants could find no means of relief. On the very threshold of what he looked forward to as the greatest opportunity of his missionary life, the saint passed away, on the island of Sancian, according to his latest biographer, November 27, 1552, though the date December 2d has always been given hitherto. Many miracles performed by him at all stages of his career as a Jesuit are attested by numerous witnesses. Xavier was beatified by Pope Paul V., in 1619, and canonized by Pope Gregory XV., in 1622. His feast day was fixed upon December 3d. His only literary remains are a catechism, some short ascetic treatises, and a collection of letters. Of the letters there are translations in most of the modern languages.

Consult: Coleridge, *Life and Letters of Saint Francis Xavier* (London, 1873); Cros, *Saint François de Xavier, sa vie, son pays, sa famille* (Toulouse, 1900-01); *Monumenta Xaveriana* (Madrid, 1899-1900).

FRANCK, fränk, ADOLPHE (1809-93). A French philosopher, born at Liocourt, Meurthe, of Jewish parents. He was professor of philosophy in various French schools, and occupied the same position at the Collège Charlemagne in Paris in 1840. He held the chair of Greek and Latin philosophy at the Collège de France from 1849 to 1852, and from 1854 to 1881 lectured there on natural law and the law of nations. He was one of the editors of the *Journal des Débats*, and the founder of *La Paix Sociale*, the organ of the league against atheism. Among his works are: *Dictionnaire des sciences philosophiques* (1843-56), of which he edited the greater part; *Le communisme jugé par l'histoire* (1849); *Philosophie et religion* (1867); and *La religion et la science dans le judaïsme* (1883).

FRANCK, CÉSAR AUGUSTE JEAN GUILLAUME HUBERT (1822-90). A French composer, born at Liège. After studying at the conservatory there he went to Paris, where he attended the Conservatory, studying under the organist Benoist and others. He settled in Paris, and in 1872, at the Conservatory, succeeded Benoist, who retired after fifty years of service. Meanwhile Franck had composed much, but found little recognition, though it is interesting, as indicating Liszt's breadth of judgment, that in the fifties chamber-music by Franck was played in Liszt's private concerts at Weimar. In 1846 Franck's oratorio *Ruth* was brought out at the Conservatory, but without success. Yet twenty-five years later it was revived at the Circe d'été, and the following year at the Conservatory, with such brilliant results that a 'Franck cult' was instituted among the younger French musicians. Franck's music, however, though admirable technically, lacks melodic spontaneity. While France at one time neglected his talent, the present tendency there is to overrate it. In the United States his best-known works are his oratorio *Les béatitudes*; chamber music; songs; and his *Variations symphoniques*, for piano and orchestra. He died in Paris.

FRANCK, fränk, MELCHIOR (c.1580-1639). A German composer, born at Zittau. He lived in Augsburg, where his first works were published in 1601. The following year he went to Nuremberg, and in 1603 became chapel-master at Coburg. His best work is in sacred music, and

some of his chorals are still sung. He is one of the most prolific and interesting of the old German composers.

FRANCK, SEBASTIAN (1499-1543). A German reformer and humorist, born at Donauwörth. Ordained to the Roman priesthood in 1524, he joined the Reformation shortly afterwards; married in 1528, and, after some minor didactic works, published at Strassburg in 1531 his *Chronika*, one of the first German attempts at universal history. He led a wandering and precarious life as a soap-boiler, author, and printer, and in 1539 settled at Basel, where he died. He appears to have been a pantheistic mystic, a forerunner of modern German idealism, of wide social sympathies and broad tolerance. His style is vigorous and clear—far superior to that of his time. His collection of *Sprichwörter* (1541) is edited by Guttenstein (1831). For his life, consult: Weinkauff, in *Birlinger's Alemannia* (Bonn, 1877), and Haggelmacher (Zurich, 1886).

FRANCKE, FRÄNK'É, AUGUST HERMANN (1663-1727). A distinguished German educator and philanthropist, founder of the Francke Institute (*Stiftungen*) at Halle. He was born at Lübeck. In the early years of his manhood his interests were primarily theological. His orthodoxy was called into question, however, partly because of the envy caused by his extraordinary popularity as a preacher, and he was therefore unable to hold his position as lecturer at Leipzig. While still a young man, his attention had been drawn to the unsatisfactory state of the German educational methods, and when, in 1695, he was called to assume the duties of pastor in a small town near Halle, he started a private school in his own house. The school grew rapidly, and Francke found it necessary to rent a building to accommodate it. In connection with it he founded a school for the children of well-to-do parents, and in 1697 he added a Latin school and a school for girls. Arrangements were made to care for orphans, and poor scholars received their meals free of charge. A corps of able teachers gathered around him; new buildings were erected; a bookseller's shop and other forms of business were undertaken to help to defray expenses. Francke's theological enemies sought to injure his thriving educational institute: but in 1713 the King of Prussia, Frederick William I., visited it and promised Francke his support. From that time the institute grew unchecked, until at Francke's death the Pedagogium, or school for the children of the wealthy, had 40 students, the Latin school 400, the common schools 1725. One hundred and seventy-five teachers were employed, all of whom were students at the University of Halle. They received their board, and afterwards their lodging, for their services. A seminary for teachers was established as early as 1707, which aimed to train young men in the methods of teaching. Thus the institute became the foremost training school of the time for teachers. The extraordinary success of Francke's Institute led to the establishment of similar institutions in other German cities, and the influence of Francke and his disciples materially affected the character of the Prussian system of public education, which was established by Frederick William I. and remains unchanged in its essential features at the present day.

Francke published a number of pamphlets on religious and pedagogical subjects; but these are of minor importance as compared with his institutional work. Consult: Kramer, *Franckes pädagogische Schriften* (Langensalza, 1885); id., *August Hermann Francke, ein Lebensbild* (Halle, 1880-82); Stein, "August Hermann Francke," in *Deutschen Geschichts- und Lebensbildern* (Halle, 1894).

FRANCKE, KUNO (1855—). A German-American scholar and author, born at Kiel. He was educated at the University of Munich, and was appointed professor of German literature at Harvard University, Cambridge, Mass. His publications include: *Zur Geschichte der Schulpoesie des zwölften Jahrhunderts* (1878); *De Hymno in Cererem Homericum* (1880); *Libelli de Lite Imperatorum et Pontificum* (1892); *Social Forces in German Literature* (1896); *Glimpses of Modern German Culture* (1898); and a *History of German Literature* (1901).

FRANCKE, WILHELM (1803-73). A German jurist. He was born at Lüneburg, and was educated at the Collegium Carolinum, Brunswick, and at Göttingen, where he was appointed professor of Roman law in 1828. In 1831 he was called in the same capacity to Jena, where he also held the position of counselor of the Court of Appeals. During the last thirty years of his life he was associated with the University of Göttingen. He stood in high repute as an authority on and teacher of Roman law, was co-editor of the *Archiv für die civilistische Praxis* (1837-73), and wrote *Das Recht der Noterben und Pflichtteilsberechtigten* (1831).

FRANCKEN, FRÄNK'ÉN. A family of painters of Antwerp, eleven in number, living in the sixteenth and seventeenth centuries. A similarity of Christian names leads to much confusion in classifying their works. When Frans the first found a competitor in Frans the second, he took the name of 'the elder,' the second being 'the younger.' But when the third Frans became a rival of the second, the latter took the name of 'the elder,' and Frans the third became 'the younger.' The eldest of the Frankens, NICHOLAES OF HERENTHALS, died in 1596. None of his works is known. HIERONYMUS (1540-1610), his eldest son, was occupied chiefly in Paris, where he was engaged in decorating the Palace of Fontainebleau, where some of his paintings remain. Others are to be found in the Dresden Museum, the Amsterdam Museum, and the Brunswick Gallery. The second son of Nicholaes was FRANS FRANKEN 'the first' (1542-1616). He studied under Floris and was dean of the Guild of Saint Luke in 1588-89. His paintings were mostly religious subjects, and are especially numerous at Brunswick and Dresden. AMBROSIUS (1544-1618), third son of Nicholaes, left more works than both his brothers. Most of them are religious subjects to be found at Antwerp, in the Church of Saint Jacques and the Museum. Among the best of them are the "Miracle of the Loaves and Fishes," and the "Martyrdom of Saint Crispin," in the Antwerp Museum. His productions are exaggerated in all respects, but he possesses greater invention than the rest. Frans 'the first' trained his sons to the profession. The third of these sons is FRANS FRANKEN (1581-1642) 'the second,' who also signed himself 'the younger.' When his son Frans grew up he also signed him-

self 'the elder.' He studied in Italy, but was also influenced by Rubens. Among his chief works are the "Works of Mercy," in the Antwerp Gallery; "Solon and Croesus," in the Brussels Gallery; "Christ Washing the Apostles' Feet," in the Berlin Museum. Nearly all European galleries possess his pictures. FRANS FRANCKEN 'the third' (1607-67) painted in the manner of Rubens. He painted religious subjects, of which there are good examples in Antwerp and Augsburg, and interiors of churches, as may be seen at Dresden and The Hague.

FRANCKENSTEIN, fränk'en-stin, GEORG ARBOGAST, Baron (1825-90). A German legislator. He was born at Würzburg, and was educated at Munich. As an Ultramontane member of the Bavarian Diet, he was opposed to the participation of Bavaria in the Franco-German War, and voted against the measure providing for the entrance of the kingdom into the German Empire. In the German Reichstag he became the leader of the Centrist Party. The principal measure introduced by him was the so-called 'Franckenstein Clause,' later incorporated as paragraph 7 of the tariff laws (July 9, 1879). He was first vice-president of the Reichstag from 1879 to 1887.

FRANCO, fränk'kò, GIOVANNI BATTISTA (1510-61). An Italian painter and engraver named Semolei. He was born at Udine, went to Rome as a young man, and there was much impressed with the work of Michelangelo. When Charles V. entered the city (1536), Franco painted the triumphal arch with scenes from Roman history. Afterwards he went to Florence and painted in company with Vasari. His drawing is better than his color. By order of the dukes Alexander and Cosimo de' Medici, he executed many portraits and pictures, and for the Duke of Urbino some work in falconry. As an engraver, Franco stands higher than as a painter. He left about a hundred etchings. The best of his works are: "Moses Striking the Rock," "Manna in the Desert," "The Adoration of the Shepherds," and "Simon the Magician." They are rather dryly finished, and have little freedom.

FRANCO-GERMAN WAR OF 1870-71. The immediate cause of this struggle was France's jealousy of the growing importance of Prussia, which power Bismarck was determined to place at the head of a united Germany, and the desire of Napoleon III. to strengthen his tottering throne by a successful war against the hereditary foe of the French nation. The actual occasion for the outbreak of hostilities was furnished by complications growing out of the political situation in Spain. On June 25, 1870, Isabella II. of Spain, who had been deposed in 1868, formally abdicated the throne. On July 5th the foreign governments were notified of her abdication, and on the same day the fact was made public that Prince Leopold of Hohenzollern had consented to become a candidate for the vacant throne of Spain. This consent was said to have the approval of the King of Prussia. The news caused intense excitement in Paris, and the Foreign Minister, the Duc de Gramont, caused representations to be made to the Prussian Government of the displeasure with which the French Government regarded the candidacy of Prince Leopold. On July 12th the announcement of the withdrawal of Prince Leopold's candidature was made.

On the following day the French Ambassador, Benedetti (q.v.), unceremoniously addressing William I. at Ems, insisted that the King should make a declaration to the effect that no Hohenzollern prince would ever be permitted to accept the Spanish crown. The King declined to listen to this demand, and broke off the interview. He sent Bismarck a copy of the French demand, with authority to make use of it. This Bismarck did, giving to the press such parts of the communication as would tend to arouse the German people. It does not appear that in so doing he misrepresented the attitude of France. Taking notice of this publication as if it had been official, the French Government, deeming itself called upon to take immediate steps for the defense of the national honor, formally declared war against Prussia, July 19, 1870.

While the popular enthusiasm in the two countries in favor of war was about equal, there proved to be a vast difference as to the state of the military preparations. The French Government supposed that from 450,000 to 500,000 men were available for instant mobilization; but the army was ill organized, imperfectly equipped, and not properly provided with depots. But 250,000 men were ready for the first movements in August, 1870, and there was no reliable reserve. The French force was in one body, practically known as the Army of the Rhine. Against this the North German Confederation was able to put into the field an army of about 450,000 men with a reserve of nearly 400,000. The French hoped that the South German States, out of jealousy of Prussia, would refuse to join her, but these joined forces at once with their countrymen, put their troops under Prussian command, and thus added to the overwhelming weight that was thrown upon France. The action of Prussia was promptness itself. King William arrived in Berlin July 15th, meeting Bismarck, Moltke, and Roon, and orders for mobilization were at once given. Three armies were formed. The first, under General von Steinmetz, was placed near Trèves, forming the right wing; the second, under Prince Frederick Charles, was sent to Rhenish Palatinate; the third, under the Crown Prince of Prussia, took its position on the frontier of Baden. The French forces were scattered over a line of about 100 miles in length. The First Corps, under Marshal MacMahon, was placed near Strassburg; the Fifth Corps, under Faily, along the frontier of the Palatinate; the Third Corps, under Marshal Bazaine, near Metz; the Second Corps, under Frossard, not far from the Prussian frontier, near Saint Avold; the Fourth Corps, under Ladmirault, near Thionville; the reserve forces, under Bourbaki and Marshal Canrobert, were partly at Nancy and partly at the camp of Châlons; the Seventh Corps, under General Félix Douay, held the fortress of Belfort. These were the positions of the two contending armies toward the end of July, 1870. On the 23d of that month Napoleon appointed the Empress Regent of France, and on the 28th left Paris with the Prince Imperial to take command of the army at Metz. The King of Prussia left Berlin to take his place in the field July 31st, accompanied by General von Moltke, as chief of staff, and Count Bismarck, and on August 2d established his headquarters at Mainz. On the same day a portion of Frossard's corps made an attack on the Prussian position at

Saarbrück, in the presence of the Emperor and his son. After protracted firing the Germans retreated, and the French occupied Saarbrück. The results of this engagement were unimportant.

The first serious conflict of the war took place August 4th, at Weissenburg, where the German advance guard was attacked by the French under Gen. Abel Douay; it ended after a battle of five hours, in the French troops retiring in great disorder, with heavy loss. General Douay was killed. The Germans had now 520,000 men and 1170 guns ready for fighting orders, while the entire force of the French (with reserves) amounted to only 350,000 men. On August 6th at Würth, the Crown Prince attacked MacMahon, who had been strengthened by divisions of the corps of Faily and Canrobert. The French suffered a terrible defeat, and lost 8000 in dead and wounded, and 6000 prisoners. The German loss was over 10,000 officers and men. On the same day a bloody battle was fought at Spichern, near Saarbrück, also known as the battle of Forbach, between General Steinmetz and General Frossard. The Germans stormed the heights of Spichern, and the French force was thrown back in disorder on Forbach and Metz. The Germans lost 4648 men in killed and wounded, while the French loss amounted to about 2000 men killed and 2000 prisoners. Thus both wings of the French army were completely defeated; the original position could no longer be held, and all the French corps gathered into two large masses to retreat along the line of the Moselle. Two separate armies were now formed—the one known as the Army of Metz, commanded by Marshal Bazaine, and the other commanded by Marshal MacMahon. By August 14th the first German army had advanced to the immediate neighborhood of Metz, and by a successful attack upon the French Third Corps under Bazaine baffled the first attempt of that commander to retreat to the line of the Marne. This developed into the sanguinary battle of Colombey-Nouilly, or of Courcelles. The Prussians lost nearly 5000 men in killed and wounded; the French loss was about 3500. The battle prevented the junction of Bazaine's army with that of MacMahon at Châlons. In the battle of Mars-la-Tour, or Vionville, fought on August 16th, the army of Bazaine was repulsed by Prince Frederick Charles, and driven back on Gravelotte with immense loss to both sides—about 16,000. On the 18th occurred the great battle of Gravelotte (q.v.), in which 200,000 Germans fought against 130,000 Frenchmen. Bazaine's army, occupying a very strong position to the west of Metz, was, after nine hours' fighting, completely defeated, cut off from its communication with Paris, and driven back toward Metz. The losses were very heavy. The French lost about 600 officers and 13,000 men; the Germans, about 900 officers and 20,000 men.

Bazaine was now shut up in the fortifications of Metz, which was invested by Prince Frederick Charles. A fourth army was organized, and placed under command of the Crown Prince of Saxony, to move rapidly upon Paris. MacMahon, marching to the relief of Metz, was cut off by the third and fourth German armies, which were converging on Paris, and on the first of September was fought the battle of Sedan, the Waterloo of the Second Empire. The forces of MacMahon were caught in an unfavorable position, where they could be attacked from all sides, and were driven

upon the fortress of Sedan, where, surrounded and defeated, the entire army surrendered (September 2d), with the Emperor, who was carried prisoner to Wilhelmshöhe. By this capitulation, 83,000 men, including 40 generals, 230 officers of the staff, and 2595 officers, became prisoners of war, in addition to 21,000 men who had been made prisoners during the battle. Meanwhile, on August 31st, Bazaine made a sortie from Metz, attempting, during that day and the following, to break through toward the north, but was driven back into the fortress.

When the news of the capitulation of Sedan and of the capture of Napoleon reached Paris it caused an upheaval. On September 4th the Third Republic was proclaimed, and a Government of National Defense was formed, of which the chief members were Jules Favre, Crémieux, Ferry, Jules Simon, and Gambetta. General Trochu, the military Governor of Paris, was its head. Gradually the Germans closed in on Paris, no serious resistance in the field being attempted. By September 19th the capital was regularly invested. The investing force was far inferior to that of the besieged in numbers, but the French forces in Paris were largely a half-trained provisional levy, brimming with disaffection and the spirit of revolution, which afterwards broke out in the Commune. Strassburg surrendered on September 28th. A few days later Gambetta escaped from Paris in a balloon and issued a proclamation from Tours calling for a levy *en masse*. On October 11th General Von der Tann, after defeating a French force, entered Orleans. On October 27th Bazaine surrendered at Metz with his army of about 175,000 men to Prince Frederick Charles. A gleam of hope was infused into the French by a momentary victory of General Aurelle de Palladines, commander of the Army of the Loire, who on November 9th beat back Von der Tann at Coulmiers, near Orleans, the French reëntering Orleans on the following day. On November 28th, however, Aurelle de Palladines was repulsed at Beaune-la-Rolande, and was again defeated before Orleans on December 2-4. Nor were the other armies put into the field by the appeals of Gambetta more successful in coming to the relief of Paris, where General Ducrot made a desperate attempt to break through the German lines at Brie and Champigny, November 30-December 3. The army of General Chanzy engaged that of the Grand Duke of Mecklenburg on the Loire, December 7-10, but was forced to retreat from this scene of operations, and on January 10-12, 1871, he was completely overthrown by Prince Frederick Charles at Le Mans. In the north, where the Germans had reached and entered Rouen as early as December 6th, the army of General Faidherbe suffered a defeat at Pont Noyelles, December 23d, and another at Bapaume, January 3d, and on January 19th it was overwhelmed by General Von Goeben at Saint Quentin. In the east, General Bourbaki made a diversion at the close of December which was at first successful, but he was repulsed by General Von Werder before Belfort on January 15-17. On December 27th the Germans opened a bombardment on Mont Averon, one of the forts of Paris, and two days later they obtained possession of the fort. After an unsuccessful sortie from Mont Valerien, led by General Trochu, January 19th, Paris, which had reached the point of starvation, capitulated January 28, 1871, a par-

tial armistice having been arranged between Bismarck and Jules Favre. Four days later the remains of Bourbaki's army retired into Switzerland. In the meanwhile, during the progress of the siege of Paris, the work of consolidating Germany into an empire had been consummated by the proclamation at Versailles, on January 18th, of William I. as German Emperor. The armistice gave France an opportunity to form a responsible government that could conduct peace negotiations. On February 8th elections were held for a National Assembly, which met at Bordeaux, February 12th, and which, on February 17th, elected Thiers Chief of the Executive. On February 16th the capitulation of Belfort closed the military operations. The Germans occupied all the forts around Paris. France was helpless, with nearly all her trained soldiers disarmed or prisoners of war, while French territory was occupied by a German army of more than half a million men. The new Government of France now undertook the task of securing peace.

The indefatigable labors of Thiers resulted, on February 26th, in the arrangement of preliminary terms of peace with Germany, which were formally accepted by the National Assembly, March 1st, by a vote of 546 to 107. The terms of this treaty were as follows: (1) The cession by France of the German-speaking part of Lorraine, including Metz and Thionville, and of Alsace, excepting Belfort; (2) France to pay five milliards of francs as war indemnity—one milliard in 1871, and the balance in installments extending over three years; (3) the evacuation of French territory to begin upon the ratification of the treaty, Paris and some western departments to be evacuated at that time, the troops in other departments to be withdrawn gradually as the indemnity was paid; (4) the German troops to be maintained at the cost of France, and not to levy upon the departments occupied by them; (5) inhabitants of the annexed territories to be allowed to choose between the two nationalities; (6) prisoners of war to be immediately set at liberty; (7) negotiations for a definitive treaty of peace to be opened at Brussels after the ratification of this treaty; (8) the administration of the departments occupied by the German troops to be intrusted to French officials under the control of the chiefs of the German corps of occupation. The definitive treaty of peace was signed at Frankfurt, May 10, 1871. The two great results of the war were the establishment of the Third Republic in France and the consolidation of Germany into an empire.

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See articles on the various battles mentioned in this text.

FRANÇOIS, FRÄN'SWÄ', JEAN CHARLES (1717-69). A French engraver, born at Nancy. He was the inventor of engraving in imitation of crayons (1740). This obtained for him the position of engraver to the King, and he received a pension. His works include plates after Van Loo, Holbein, Boucher, and others. His work is of mediocre quality.

FRANÇOIS, KUET VON (1853—). A German cartographer and explorer of Africa. He was born at Luxemburg, and after completing his military education at Wahlstatt and Berlin, served in the German Army during the war of 1870-71, in which his father, General François, met his death at the battle of Spichern. He was a member of Wissmann's African expedition in 1883, and two years later was the companion of that famous soldier and explorer, on the expedition in which two tributaries of the Congo were explored. On a tour undertaken in 1887 he penetrated from the coast at Togo northward to about the twelfth parallel, north latitude, and two years later, in recognition of his distinguished services, was appointed commander of the military contingent in German Southwest Africa. As acting Imperial Commissioner, to which position he was appointed in 1891, he explored as far as Lake Ngami. His vigorous warfare against the native chieftain, Henrik Witboi, an inveterate enemy of German domination, resulted in the total rout of the Hottentots. Prevented from following up his victory by reason of disagreements among his officers, and foreseeing the impossibility of a complete subjugation of the enemy under the circumstances, he resigned his commission in 1895. In 1901 he settled in German Southwest Africa. His principal works include: *Im Innern Afrikas*; *Die Erforschung des Kassai*, in collaboration with Wissmann (2d ed. 1891); and *Die Erforschung des Tschuapa und Lulongo* (1888).

FRANÇOIS, LUISE VON (1817-93). A German author. She was born at Herzberg, Province of Saxony, and after the death of her father lived for several years at Weissenfels, Minden, and Halberstadt, but chiefly at the house of her uncle, General Karl von François, at Potsdam. Her works embrace mainly novels, and entertaining stories, several of which have become very popular. Among them are: *Die letzte Reckenburgerin*, a novel (6th ed. 1895); *Frau Erdmuthens Zwillingssöhne* (2d ed. 1891); *Stufenjahre eines Glücklichen* (1877); and *Der Katzenjunker* (1879).

FRANÇOIS DE NEUFCHÂTEAU, de nê'shâ'tô', NICOLAS LOUIS FRANÇOIS, Count (1750-1828). A French statesman and poet. His first volume of verse was published in 1766. Encouraged by Voltaire, he obtained the chair of rhetoric at Toul in 1770. In 1792 he was Deputy to the National Assembly, of which he became secretary and finally president. In 1793 he was imprisoned for the publication of a comedy, *Paméla, ou la vertu récompensée*. In 1797 he became Minister of the Interior under the Directory, and in 1804-06 he was president of the Senate. After the Restoration he retired from politics. His works include *Fables et contes en vers* (1814), *Les trois nuits d'un gouteux* (1819), and many miscellaneous articles and translations.

FRAN'COLIN (Fr., Sp. *francolin*, Port. *francolin*; probably diminutive of Port. *frango*, *frango*, chicken). A bird of the genus *Francolinus*, of the family Tetraonidae, closely allied to partridges. They are natives of Asia and Africa. One species only (*Francolinus vulgaris*) was formerly found in the most southern parts of Europe, but is now extinct there, though still common in various parts of Asia and in Cyprus. Most of the thirty species of francolin known are found in Africa, and all are objects of sport, and good for food.

FRANCONIA (ML., from OHG. *Franchun*, Franks). The name of a mediæval duchy in Germany, embracing the country on both sides of the Main, from the Rhine to the mountains of Bohemia. The region was conquered by Clovis, and later was dependent upon Austrasia (q.v.). After the Treaty of Verdun (843) it was part of the German kingdom. In 911 Conrad of Franconia was raised to the royal throne, and a century later the choice of the German princes again fell upon the Franconian House, which, by its direct and collateral branches, gave kings and emperors to Germany from 1024, when Conrad II., the Salic, began his reign, till 1125, when Henry V. died, and again from 1138, when Conrad III. ascended the throne, till 1254, when Conrad IV., the last Hohenstaufen Emperor, died. In 1022 Franconia was divided into Franconia Occidentalis and Franconia Orientalis (West and East Franconia). The former, in 1155, passed to Conrad, son of Frederick Barbarossa (q.v.), who was given the title of Count Palatine of the Rhine. During its connection with the Crown, Franconia increased in extent and importance, while its great spiritual principalities of Mainz, Speier, Worms, Bamberg, and Würzburg acquired both wealth and political influence. After 1155 the name Franconia was usually given only to the eastern portions of the ancient duchy. In 1512 Maximilian I. established the circle of Franconia, without, however, including in it the Palatinate. With the dissolution of the Holy Roman Empire in 1806, the name of Franconia disappeared from among the political divisions of Germany, but since 1837 it has been revived in the Kingdom of Bavaria (q.v.), where those portions of the ancient Franconian region which had been known as the circles of the Upper Main, Rezat, and Lower Main are now designated Upper, Middle, and Lower Franconia.

UPPER FRANCONIA includes the northeast portion of Bavaria. It is watered by the Main, Saale, and other streams. Its surface rises in the Fichtelgebirge to a height of 3500 feet. Farther west are the mountains of the Franconian Forest, which are considerably lower. The valleys produce good crops and fruit, and the district is rich in minerals. Population, in 1900, 607,903. The capital is Bayreuth.

MIDDLE FRANCONIA, which borders on Württemberg, is intersected by branches of the Franconian Jura, but has few rivers of importance besides the Regnitz and Altmühl, which are connected by the great Ludwigskanal. It produces good wine, but is principally celebrated for its hop-gardens. Population, in 1900, 815,556. The capital is Anspach. Nuremberg is the principal town.

LOWER FRANCONIA, which occupies the northwest part of Bavaria, is the richest and best cul-

tivated of the Franconian districts, and is celebrated for the excellence of its wines. The district is noted for its mineral springs at Kissingen, Brückenau, and Wipfeld. Population, in 1900, 650,758. The capital is Würzburg.

FRANCONIA MOUNTAINS. See **WHITE MOUNTAINS**.

FRANCS-TIREURS, frän'té-rér' (Fr., free-shooters). The name given to bands of French soldiers that sprang into existence during the Franco-German War of 1870-71. They had their origin in the military societies formed in north-eastern France as early as 1867. They did not form a part of the regular army until November, 1870, and at first their military organization was very imperfect. They waged irregular warfare by attacking small detachments of the enemy and baggage trains as well as single travelers. At first they were not recognized by the Germans as having any military standing at all, and when seized were shot or hanged; but after a time, when they received a better organization, and coöperated with the regular French Army, such recognition was accorded them. They carried on an irregular warfare long after the main French armies had been wiped out. See **GUERRILLAS**.

FRANCUCCI, frän-kö'chê, INNOCENZO. See **IMOLA**, INNOCENZA DA.

FRANEKER, frän'e-kër. A town of the Netherlands, in the Province of Friesland, situated on the canal between Harlingen and Leeuwarden (Map: Netherlands, D 1). It was formerly the seat of a university founded in 1585 by the Frisian States and abolished by Napoleon. Franecker has a church dating from the fifteenth century, a town hall (restored) built in 1591, and a curious astronomical model, showing the motions of the planets, built in 1774-81 by a citizen named Eise Eisinga. Population, in 1890, 7143; in 1900, 7114.

FRANGIPANI, frän'jé-pü'nê (named after the Marquis Frangipani, major-general under Louis XIV.). A scent or perfume, either derived from or manufactured in imitation of a flower produced by a West Indian tree of the genus *Plumiera*, called the red jasmine. .

FRANGIPANI. An illustrious and powerful Roman house, which began with Leo Frangipani in 1014 and attained the summit of its power in the eleventh and twelfth centuries. The residences and strongholds of the Frangipani were near the Arch of Titus and the Coliseum. The rivalry of the Frangipani with the house of the Pierleoni not only occasioned repeated civil wars in the State, but likewise troubles in the Church. In the early part of the twelfth century the two families controlled the college of cardinals. The Frangipani were partisans of the Emperor, the Pierleoni usually opponents. After the death of Frederick II., however, the family interest was enlisted in the Papal cause. Giovanni Frangipani captured Conradin of Hohenstaufen, and delivered him, in 1268, to Charles of Anjou. The origin of the name Frangipani is attributed to the family's benevolent distribution of bread in time of famine. Consult Gregorovius, *Rome in the Middle Ages* (trans., London, 1895-1900).

FRANGIPANI was also the name of a noble family of Croatia, whose members distinguished themselves in the wars against the Turks. The

most celebrated of the line were John Frangipani, who about 1390 was made Ban of Croatia, Slavonia, and Dalmatia, and Christopher Frangipani, who fought at Mohács (1526). Francis Christopher Frangipani about 1670 entered into a conspiracy against the Emperor Leopold I., having for its ultimate object the restriction of Germanic influences in Hungary, and the reassertion of the Magyar power. The conspiracy was discovered and Frangipani was executed in 1671.

FRANK, FRÜHK, ALBERT BERNHARD (1839-1900). A German botanist. He was born in Dresden, and was educated at Leipzig. From 1881 until his death he was professor of vegetable physiology at the Agricultural College at Berlin. His works consist chiefly of valuable text-books, and include: *Die Krankheiten der Pflanzen* (1880); *Lehrbuch der Pflanzenphysiologie mit besonderer Berücksichtigung der Kulturpflanzen* (1890); *Pflanzenbuch für niedere und mittlere Landwirtschaftsschulen* (1894); *Kampfbuch gegen die Schädlinge unserer Feldfrüchte* (1897); and with Krüger, *Schildlausbuch* (1900).

FRANK, FRANZ HERMANN REINHOLD VON (1827-94). A German theologian, born at Altenburg, and educated at Leipzig. He was professor of theology at Erlangen from 1857 until his death, was co-founder of the *Neuen Kirchlichen Zeitschrift*, and wrote a large number of works, most of which have been several times republished. These include: *System der christlichen Gewissheit* (2d ed. 1885-86); *System der christlichen Wahrheit* (2d ed. 1885-86); *System der christlichen Sittlichkeit* (1884-87); *Zur Theologie A. Ritschels* (3d ed. 1891).

FRANK, GUSTAV WILHELM (1832-1904). A German theologian, born in Schleiz. He was educated at Jena, and held a professorship at that university from 1864 to 1867, when he was appointed professor of dogmatics and ethics at the University of Vienna. He published an edition of Apelt's *Religionsphilosophie* (1860), and is the author of *Geschichte der protestantischen Theologie* (1862-75); and *Die evangelisch-theologische Fakultät in Wien von ihrer Gründung bis zur Gegenwart* (1871).

FRANK, JACOB (1712-91). A pseudo-Messiah of the Jews and founder of a sect called Frankists after himself, or Zoharites after their sacred book. His real name was Jakob Lebowicz, and he was the son of a rabbi of southern Galicia. When a young man, traveling in the East, the Turks called Jakob a Frank, their common appellation for a European, and this surname he always retained. After his return to Poland he settled in Podolia and gathered around him many rabbis and persons skilled in the science of the Cabala. He represented himself to be the second Messiah and had many followers. In 1756 he was arrested and imprisoned for a time, but was released and soon after, with many of his followers, professed Christianity. He quickly, however, resumed his earlier Messianic pretensions, made large collections of money from his adherents in Poland and Bohemia, and went to Brünn in Moravia, where he lived luxuriously on the offerings of his followers. In 1786 he removed to Offenbach, where he displayed even greater magnificence, declaring himself to be the Messiah, and regarded as immortal by his ad-

herents, until he was stricken down with apoplexy December 10, 1791. The sect still exists in Poland, numbering among its members persons in Poland, Rumania, and Turkey. Consult Graetz, *Frank und die Frankisten* (Breslau, 1868).

FRANK, JOHANN PETER (1745-1821). A German physician. He was born at Rothalben, Bavaria, and studied medicine at Heidelberg and Strassburg. In 1785 he accepted a call to Pavia, where he remained until his appointment to the directorship of the General Hospital at Vienna (1795). With this institution he was associated until 1804, during which time he also delivered lectures at the university. After a short term as professor of medicine at Vilna, Russia, he was appointed physician in ordinary to Czar Alexander I., returning to Vienna in 1808. His influence upon the development of medical practice in Lombardy, Austria, and Russia was extraordinary. He devoted himself chiefly to the improvement of public sanitation, of which he has been called the founder, and several of the works written by him on this subject have served as a basis for the further development of sanitary legislation. His principal works include: *System einer vollständigen medizinischen Polizei* (6 vols., 1779-1819, supplement, 3 vols., 1812-27; translated into Italian, 1808-30); *De Curandis Hominum Morbis Epitome* (6 vols., 1792-1821; German trans., 3d ed. 1840-41); *System der landwirthschaftlichen Polizei* (1789-91); and *Selbstbiographie* (1802).

FRANK'ALMOIGNE (Lat. *libera elemosyna*, free alms). A form of feudal tenure, whereby lands were held by religious houses or persons for charitable purposes. By the ancient common law of England, a man could not alien lands which came to him by descent without consent of his heir, but he might give a part to God in free alms. It was an old Saxon tenure, and continued under the Norman revolution, through the great respect that was shown to religion and religious men. This is the tenure by which almost all the ancient monasteries and religious houses held their lands, and by which the parochial clergy and very many ecclesiastical foundations held them at this day. The statute of 12 Car. II., c. 24, which abolished the old tenures, specially reserved tenure in frankalmoigne. The condition on which lands in frankalmoigne were held was, that masses and divine services should be said for the grantor and his heirs, but no particular service was specified. At the Reformation, the nature of the services was changed, but the tenure was suffered to continue. A tenant in frankalmoigne did no fealty to his overlord, and in the event of failure to perform the service the latter was not entitled to distrain, but might complain to the ordinary or visitor. In this respect this tenure differed from tenure by divine service, i.e. where lands were given on condition of performing a specified service, as saying a mass on a particular day, or distributing certain alms. In this case the tenant was bound to render fealty, and the lord was entitled to distrain on failure to perform the service. By the Anglo-Saxon law lands held in frankalmoigne were subject to the *trinoda necessitas*, or repairing highways, building castles, and repelling invasions. In Scotland lands conveyed to the Church in *puram elemosynam* were said to be

mortified. See FEE; FEUDALISM; TENURE. Compare MORTMAIN.

FRÄNKEL, fränk'el, BERNHARD (1836—). A German physician. He was born at Elberfeld, and was educated at Würzburg and Berlin, where in 1884 he was appointed professor. In recognition of his valuable investigations on diseases of the throat and nose, he was, in 1887, made director of the clinical institute of the university especially devoted to the treatment of those diseases. In addition to the treatise entitled "Allgemeine Diagnostik und Therapie der Krankheiten der Nase," in Ziemssen's *Handbuch der speziellen Pathologie und Therapie*, vol. iv. (1879), he wrote "Skrofulose und Tuberkulose," in Gerhard's *Handbuch der Kinderkrankheiten*, vol. iii. (1878); and *Der Kehlkopfkrebs* (1889).

FRÄNKEL, WILHELM (1841-95). A German engineer. He was born at Odessa, Russia, and was educated at the Polytechnic Institute at Dresden, where he was appointed professor in 1865. His devices for gauging the carrying capacity of iron bridges have been widely adopted. His articles on bridge and railroad construction include "Bewegliche Brücken," in the *Handbuch der Ingenieur-Wissenschaften* (2d ed. 1888).

FRANKENBERG, fränk'en-bèrk. A flourishing manufacturing and trading town of Saxony, Germany, 32 miles southwest of Dresden, and near Chemnitz (Map: Germany, E 3). It has manufactures of cottons, woolens, silk stuffs, cigars, Venetian blinds, and the largest calico-printing works in Saxony. There are a number of picturesque castles and churches in the vicinity, and an iron cross, dedicated to the poet Körner, is to be seen in a spot made famous by one of his ballads. Population, in 1890, 11,400; in 1900, 12,728.

FRANKENHAUSEN, fränk'en-hou'zen. A town of the Principality of Schwarzburg-Rudolstadt, Germany, on the Wipper, 27 miles north-northwest of Weimar (Map: Germany, D 3). There are productive salt springs here, and the manufacture of cigars, sugar, and articles in mother-of-pearl is carried on. The salt baths are much frequented. In the neighborhood are mines of lignite, and the Barbarossa cavern, discovered in 1865. Population, in 1890, 5944; in 1900, 6383. Frankenhause figures in history as the scene of a battle between the rebellious peasants under Thomas Münzer, May 15, 1525, and the Saxon, Brunswick, and Hessian troops, in which the peasants were defeated.

FRANKENSTEIN, fränk'en-stin, OR, THE MODERN PROMETHEUS. A novel by Mrs. Shelley, begun in 1816, and published anonymously at London in 1818. An American edition appeared at Philadelphia in the same year, and another at Boston in 1869. The title character of the tale is a student who finds the secret of creating life artificially. His first creation is a horrible yet pathetic monster, who murders his friend and pursues Frankenstein himself from one land to another, complaining of his loneliness and begging his unfortunate maker to create a mate for him.

FRANKENTHAL, fränk'en-täl. A flourishing industrial town of Germany, situated in the northeastern part of the Bavarian Palatinate,

about 10 miles northwest of Mannheim and near the Rhine (Map: Germany, C 4). Its only particular object of interest is the portal of the Abbey Church, founded in 1119. The industrial establishments of Frankenthal include machine-shops, iron-foundries, and sugar-refineries. Frankenthal is named as early as the eighth century. Population, in 1895, 14,445; in 1900, 16,849.

FRANKFORT, or **FRANKFORT-ON-THE-MAIN** (Ger. *Frankfurt am Main*, pron. fränk'föört äm mIn). A city of Prussia, in the Province of Hesse-Nassau, government district of Wiesbaden, situated on the right bank of the navigable Main (Map: Prussia, C 3). It lies in a fertile and picturesque plain surrounded by mountains, and embraces the important suburb of Sachsenhausen on the left bank, connected with the main city by several stone or iron bridges. Frankfort still has many old and narrow streets with high-gabled projecting houses; but its ancient walls and ramparts have been converted into promenades, and there are now wide handsome streets and broad quays in the modernized sections. The gates of the famous Judengasse, which were closed at night to prevent the egress of the Jewish inhabitants, were razed at the time of the French occupation in 1806. Gradually all the interesting old houses in this street, now called Börnestrasse, have been torn down, except the family house of the Rothschilds, one of the attractions for sightseers. In the heart of the ancient town is the Römerberg, or market-place, with the Justitia Fountain in its centre. It was the scene of popular rejoicings after the election of an Emperor. Hebrews were formerly not allowed to enter this square. The main artery of the new town is the Zeil, continued by the Kaiserstrasse. The most prominent squares are the Rossmarkt with the Gutenberg Monument, the Goetheplatz with Schwanthaler's statue of Goethe, the Schillerplatz with the statue of Schiller, the Kaiserplatz with an attractive fountain, the Börsenplatz, and the Opernplatz. Among the spacious streets leading to the outer quarters of the city the Bockenheimer Landstrasse is the most noteworthy.

The ancient Cathedral of Saint Bartholomew ranks first among Frankfort's ecclesiastical structures. Founded about 870, it was built after Gothic patterns at different periods between 1235 and 1415. The election, and from 1562 the coronation, of the German emperors took place here. The Wahlkapelle (election chapel) dates from 1355. Of the other churches, there may be mentioned the Church of Saint Leonhard, erected in 1219-1507; the Nikolaikirche, a graceful edifice of the thirteenth century; the Katharinenkirche, built in 1680, containing fine monuments and paintings; and the new Church of Saint Peter. The Paulskirche, erected in 1787-1833, is memorable as having been the seat of the German National Parliament of 1848-49. The most prominent among the ancient secular buildings is the Römer, which is in reality a group of twelve separate mediæval houses, reconstructed and enlarged at various times. Here in the Kaisersaal, or Imperial Hall, the newly elected Emperor held his public banquet. The hall is embellished with good modern portraits of all the German emperors. Other interesting old structures are the Leinwandhaus, or Draper's Hall, now the Municipal Historical Museum, containing a valuable collection of antiquities and some paintings,

and among whose documents the Golden Bull is preserved (see HISTORY below); the Gothic Haus Fürsteneck; the Steinerne Haus of 1464; the Haus zum grossen Engel of 1562, half Gothic and half Renaissance; the Tuchgaden, where the guild of butchers was wont to celebrate the coronation of the emperors; the Goldene Wage, with an ornate façade; and the Haus zum Rebstock with its picturesque court. More famous is the Goethe house, in which the poet was born and spent his boyhood. The house is now to be seen as it was in Goethe's youth, the restorations and refurnishings being due to the Deutsche Hochstift. The adjoining Goethe Museum contains portraits, autographs, letters, etc., and also the Goethe Library—a specialized collection of the works of the best German period.

Among the modern public buildings are the City Library, having a fine Corinthian portico; the Municipal Record Office; the new Exchange with a handsome hall and rich façade; the beautiful opera house, accommodating 1900 spectators; the law courts and the post-office, and the magnificent Central Railway station, opened in 1887, unsurpassed by any structure of its kind on the Continent. In Sachsenhausen is situated the splendid Stüdel Art Institute, in the Italian Renaissance style, with a fine portal and a dome. Its notable picture gallery is especially rich in specimens of the Dutch and the early Flemish masters, and of the older Düsseldorf School. Hals, Brouwer, Teniers the Younger, Van der Weyden, and Van der Velde are well represented; and Van Eyck and Moretto merit particular attention. Among the moderns, Overbeck, Veit, Lessing, Böcklin, and Lenbach are also to be seen to advantage. The gallery comprises, in addition, some interesting sculptures, and one of the best collections of engravings in Germany (numbering 60,000 examples), and a school of art for students of painting, sculpture, and architecture. The environs and the public grounds which surround Frankfort, on the site of the ancient fortifications, are very attractive. The Taunus promenade is especially noteworthy. Among the statues and monuments not already mentioned are those of William I., Börne, and Charlemagne (on the picturesque mediæval Old Bridge across the Main), and Schopenhauer, who lived in Frankfort from 1831 to 1860.

The important commercial standing of Frankfort is due chiefly to its financial strength, although its industries developed considerably during the last quarter of the nineteenth century. The manufactures include chemicals (principally printer's ink), gold and silver wire, machinery, carpets, drugs, tobacco, and electric supplies. The city is the seat of many of the most important industrial and mercantile associations of southern Germany, as well as the home of some of the strongest moneyed institutions in the world, the banks of Frankfort having been famous since the days of the early Rothschilds. Commercially it was well known as early as the sixteenth century, when its semi-annual fairs attracted merchants from every direction. With the establishment of the German Customs Union and the development of Continental railway systems, its advantages have considerably diminished in importance. The supremacy in the book-publishing trade, which Frankfort enjoyed for many generations, was long ago gained by Leipzig. The

city is one of the most important railway centres of Europe; and its shipping, due to the recent canalization of the Main and important improvements of the river harbor, has considerably increased. In 1900 the arrivals and departures of ships were over 10,000.

The government is administered by a chief burgomaster, an assistant burgomaster, 24 magistrates, 3 assessors, and a council of 64 members. The municipality operates its own water-works and gas plant, but has leased its street railways to a private company. The water-supply is excellent, the city having of late expended 30,000,000 marks (\$7,140,000) on this service. The superior sanitary conditions have reduced the death-rate to a low figure. Frankfort's municipal debt in 1900 was about \$23,000,000, of which more than one-half stood for property representing value of more than twice this particular indebtedness. For schools there is annually expended about \$1,000,000; for charities, \$200,000; for the street-cleaning service, \$170,000; for police, \$58,000. The educational institutions include three gymnasia, a number of Real-schulen, twenty-five public schools, an industrial art school, several music schools, a teachers' seminary, and several homes for imbecile and physically deformed children. The Museum of Art and Industry has an interesting collection of furniture, china, bronzes, panelings, etc. The municipal library contains about 262,000 volumes, 414,000 manuscripts, a collection of coins, and Marchese's marble statue of Goethe. There are also not a few smaller public libraries, with reading-rooms, several learned societies, art leagues, and botanical and zoological gardens, besides the many museums. The three important theatres receive subsidies from the city. The hospitals and other charitable institutions are numerous and creditable examples of their kind.

The figures for the population of Frankfort have more than doubled since 1880, partly because the outlying districts have been absorbed. The inhabitants then numbered 136,819, as against 40,000 in 1800. By 1890 the total had reached 179,985, and in 1900, 288,989. About 60 per cent. of the population is Protestant.

HISTORY. Although Frankfort does not appear in history until 793, it is probable that at a very early period some settlement occupied the present site of the city, which was then the meeting-place of a number of Roman military roads running from Mainz east. In 794 Charles the Great held a church council at Franconovurd (see FRANKFORT, COUNCIL OF), and mention is made at the same time of a palace there, which Charles's son, Louis the Pious, greatly enlarged in 822 and made his residence. After the partition of Charles's empire, Frankfort became the capital of the East Frankish Kingdom, and as such it frequently appears in the documents of the time in connection with many important diets and ecclesiastical assemblies. Its political importance declined after the extinction of the Carolingian dynasty, but it still remained an important centre of trade. After 1152 the kings of the Romans were chosen at Frankfort; and this custom was formally sanctioned by the Golden Bull of 1356, which made it the *Wahlstadt*, or Electoral City of Germany. In 1245 Frankfort attained the rank of a free Imperial city, and from that time until about the middle of the

fourteenth century it steadily acquired greater powers of self-government, including an independent mint. Frankfort adopted Protestantism about 1530, and in 1536 it joined the Schmalkaldic League (q.v.). After the middle of the sixteenth century the German emperors were crowned here. The town suffered severely from pestilence during the Thirty Years' War. Like many another city of Germany, it was ruled for hundreds of years by a merchant oligarchy, which bitterly resisted all attempts on the part of the guilds to secure a share in the government. In 1612 a popular insurrection under the leadership of one Fettmilch broke out against the misgovernment of the patrician families. The lower classes improved the opportunity to vent their spite upon the Jews, who from an early period constituted an important element of the population. The Jews were forced to flee from the city, and for four years the popular leaders were in power. Order, however, was restored in 1616 by the intervention of the Emperor. The Jews were restored, and the only result of the insurrection was to strengthen the ruling oligarchy. In the revolutionary wars, Frankfort was occupied by the French in 1792, in 1796, and again in 1806. In 1806 it ceased to be a free Imperial city, and was given by Napoleon to Dalberg, the Primate of the Confederation of the Rhine. In 1810 Napoleon created for Dalberg the Grand Duchy of Frankfort, having an area of about 2000 square miles. This disappeared with the downfall of Napoleon, and Frankfort regained its rank (along with Hamburg, Bremen, and Lübeck) as a free city at the Congress of Vienna, and in 1816 became the capital of the German Confederation. During the revolutionary period of 1848 it was the very centre of German nationality and the battleground of the opposing tendencies of the time. The Vorparlament (q.v.) met there on March 31, 1848, and from May 18, 1848, to May 30, 1849, it was the seat of the National Assembly convened to bring about the reconstitution of Germany. The period after 1850 was marked by the abandonment of the old oligarchic constitution and the enactment of liberal legislation. Freedom of labor was then completely established for the first time, and the Jews were emancipated. In the war of 1866 Frankfort embraced the cause of Austria. The city was occupied by the Prussians on July 16th, and on October 18th it was incorporated with Prussia. On May 10, 1871, the definite treaty of peace, marking the end of the Franco-German War, was signed at Frankfort. Consult: Battonn, *Oertliche Beschreibung von Frankfort* (Frankfort, 1861-75); Bleicher, *Statistische Beschreibung der Stadt Frankfort am Main und ihrer Bevölkerung* (2 parts, ib., 1892, 1895); Wolff and Jung, *Die Baudenkmäler in Frankfort* (ib., 1895); Horne, *Geschichte von Frankfort* (ib., 1893); Stricker, *Neuere Geschichte von Frankfort seit 1806* (ib., 1874-81); Mentzel, *Frankfort am Main, ein Städtebild* (ib., 1898).

FRANKFORT. A city and the county-seat of Clinton County, Ind., 45 miles northwest of Indianapolis; on the Lake Erie and Western, the Vandalia Line, the Louisville, New Albany and Chicago, and the Toledo, Saint Louis and Kansas City railroads (Map: Indiana, C 2). It has a public library, and a fine court-house and high-school building. The city is in a productive agricultural district, has a supply of natural gas,

and manufactures brick and tile, lumber, flour, brick-making machinery, agricultural implements, crackers, etc. There are also large wholesale grocery establishments. The electric-light plant is owned by the municipality. Population, in 1890, 5919; in 1900, 7100.

FRANKFORT. A city, the capital of Kentucky, and the county-seat of Franklin County, 55 miles east of Louisville; on both sides of the Kentucky River, which is spanned by a suspension bridge 700 feet long, and on the Louisville and Nashville and the Chesapeake and Ohio railroads (Map: Kentucky, G 2). The city is situated amid picturesque scenery, in the heart of the 'Blue Grass' region of the State. On one of the hills near by is the Franklin Cemetery, which ranks with the most beautiful in the South, and in which are buried Daniel Boone and other persons prominent in the history of the State. There are monuments to the soldiers who died in the wars of 1812 and with Mexico. Among the prominent buildings are the State House, the Governor's Mansion, the State Arsenal, the State Penitentiary, the State Home for Feeble-Minded Children, and the State Colored Normal School. The State Library has over 100,000 volumes. The river is navigable, and, by means of a lock and a dam, furnishes abundant water-power. Frankfort carries on a very considerable trade, and has extensive manufactures of lumber, whisky, flour, chairs, shoes, twine, carriages, etc. The government, under a charter of 1893, is vested in a mayor, elected every four years, and a municipal council, which elects most of the administrative officials not chosen by popular vote. Population, in 1890, 7892; in 1900, 9487.

Frankfort was founded in 1786, by Gen. James Wilkinson, who made it the centre of his commercial operations, and, for a time, of his Spanish intrigues. In 1792 it became the capital of the State, though five years later it had a population of only 441, of whom 112 were slaves. In the fall of 1862, during the Civil War, Frankfort was occupied by the Confederate General Braxton Bragg (q.v.), and in the presence of the Confederate Army and a large crowd of citizens, Richard Harves, the chosen representative of the Confederate faction of the State, was, on October 4th, formally inaugurated Governor. The approach of General Buell forced Bragg to evacuate on the same day. In 1900 William Goebel, Democratic Governor-elect, was assassinated here, and Frankfort was the centre of considerable excitement during the prolonged controversy over the Governorship.

FRANKFORT, COUNCIL OF. An assembly convened at Frankfort-on-the-Main by Charles the Great in 794, and attended by all the bishops and many ecclesiastics of the Frankish kingdom, Italy, Aquitania, and even by some ecclesiastics from England. Its principal business related to: (1) The doctrine of Adoptianism (see *ADOPTIAN CONTROVERSY*), as recently revamped by Elipandus and Felix; and (2) the question of image-worship. Adoptianism was condemned, and also the rendering of Latria (the worship due to God alone) to images, under the mistaken idea that the second Council of Nicæa had sanctioned it. The canons of the Council have the customary range, and touch upon many matters. Two of them of more than curious interest are (1) the thirty-third: "The Catholic belief in the Holy Trinity, the

Lord's Prayer, and the Apostles' Creed should be preached and taught to every one"; and (2) the fifty-second: "Let no one fancy that God can be prayed to only in three languages, because God may be worshiped in all languages, and will hear the prayers of all men if they are for proper things." Consult: Mombert, *Charles the Great* (New York, 1888); Hefele, *Conciliengeschichte* (Freiburg, 1874). The original canons are in Migne, *Patrol Lat.*, xcvi. See CAROLINE BOOKS.

FRANKFORT-ON-THE-ODER, *o'dër*. The capital of a government in the Prussian Province of Brandenburg, situated on both sides of the Oder, 50 miles east-southeast of Berlin (Map: Prussia, F 2). It consists of the old town on the left bank and a number of suburbs. On the west of the old town are beautiful promenades laid out on the site of the ancient ramparts. Frankfort has a number of fine streets and squares adorned with monuments. Among the older churches are the Church of Saint Mary, a brick building of the thirteenth century, with wood carvings, stained glass, and a candelabrum thirteen feet high, and the Reformed Church, built in the Transition style at the beginning of the thirteenth century, and recently renovated. The splendid Rathaus, dating from the beginning of the seventeenth century, and the municipal theatre, are among the most noteworthy secular buildings. Frankfort has a monument to the poet Ewald von Kleist (q.v.), and an especially fine monument by Unger to Prince Frederick Charles (died 1885). The university, established in 1506, was transferred in 1811 to Breslau. Frankfort has a gymnasium, founded in 1694, Realgymnasium, and a number of other institutions for secondary education. The benevolent institutions include one municipal and four private hospitals, and two orphan asylums.

The manufactures of Frankfort include machinery, boilers, and other iron products, glass articles, pottery, musical instruments, chemicals, chocolate, sugar products, paper, leather, etc. The extensive railway shops furnish employment to over 1000 hands. The trade of Frankfort is, however, in a state of decadence, owing to the proximity of Berlin and to the decline of the town's three annual fairs. There is good water and rail communication, and an electric street railway accommodates local traffic. Population, in 1890, 55,738; in 1900, 61,852, including 4134 Roman Catholics and 747 Jews. The position of Frankfort early gave it great commercial importance in the trade with Poland. After receiving municipal rights in 1253, it soon developed into a commercial centre of considerable magnitude. The town suffered in the Thirty Years' War and the Seven Years' War as well as during the Napoleonic wars.

FRANKINCENSE (from OF. *franc encens*. ML. *francum incensum*, pure incense, from *francus*, pure; probably connected with OHG. *Franko*, Frank. Lat. *Franci*, Franks, AS. *franka*, Icel. *frakki*, spear + *incensum*, incense, from Lat. *incendere*, to burn, from *in*, in + *cendere*, to burn). A name employed to designate various resinous substances which diffuse a strong fragrance in burning, and which are on that account used in certain religious services. There is good reason to believe that the frankincense of the Jews, and also of the ancient Greeks and Romans, was chiefly or entirely the substance

now known as *olibanum* (q.v.), the product of an Indian tree, *Boswellia serrata*. It was formerly supposed to have been obtained from some species of *Juniperus*, which are generally believed not to yield such a product; the prized frankincense of the ancients was brought from the East. Several trees, such as certain species of *Protium* and of *Croton*, yield substances used as frankincense in place of *olibanum*. The silver fir in Europe furnishes a resinous product which is the common frankincense of the pharmacopœias. American turpentine is also often sold under this name. It is used in the composition of stimulating plasters, etc. Burgundy pitch is made from it. It is a spontaneous exudation from the tree, hardening by exposure to the air, and is generally of a whitish or pinkish color, with a rather agreeable odor and a balsamic taste. See BOSWELLIA; FIR.

FRANKING PRIVILEGE. The right of sending mail matter free of charge. In England this privilege was secured to members of Parliament at first by warrant of the Postmaster-General and latterly by statute. It was abolished in 1840. In this country the privilege was accorded by statute to Revolutionary soldiers in actual service, to various executive officers of the United States Government, as well as to Senators and members of Congress. It was abolished in 1873, but formally restored a few years later, and at present officers of the United States Government may send and receive through the mails all public documents without payment of postage, the name and office of the sender being written thereon. This privilege does not extend, however, to those officers who are authorized to make requisitions upon the Postmaster-General for official postage stamps. Seeds and agricultural reports may be mailed free by the Commissioner of Agriculture and by members of Congress. The franking privilege is frequently abused. As no penalty is attached to the improper use of the frank, it has been recommended that a penalty be imposed by act of Congress. Many officers are allowed to send their communications in unstamped envelopes marked 'official business.' An unlawful use of such an envelope subjects the user to a penalty of \$300.

FRANKISH VERSION. See BIBLE.

FRANKL, frän'kl', LUDWIG AUGUST, Ritter von Hochwart (1810-94). An Austrian poet. He was born in Bohemia, of Jewish parentage, and was educated in medicine in Vienna, but preferred journalism and literature. His *Habsburglied* (1832), a series of ballads in chronological order, placed him among the romanticists. Among his best known works are *Sagen aus dem Morgenlande* (1834), and the epic *Christoforo Colombo* (1836). In 1856 he established a school in Jerusalem, and described the condition of the Orient in *Nach Jerusalem* (1858) and *Aus Aegypten* (1860). Jewish subjects are treated by him in the two poems *Rahel* (1842) and *Der Primator* (1864), and in the historical work *Zur Geschichte der Juden in Wien* (1853). Frankl also took an active interest in the philanthropic work of Vienna and in public affairs, especially in 1848, when the liberal spirit of his poetry made him widely known.

FRANK'LIN. A district of Canada, formed in 1895. It is composed of numerous large and small islands north of the mainland, including

Baffin Land and Prince Albert Land (Map: Canada, N 2). The area is estimated at 299,000 square miles. Franklin is mostly within the Arctic Circle, and is almost wholly destitute of animal and vegetable life. The only inhabitants are some Eskimo on Baffin Land.

FRANKLIN. A city and the county-seat of Johnson County, Ind., 20 miles south of Indianapolis; on the Cleveland, Cincinnati, Chicago and Saint Louis and the Pittsburg, Cincinnati, Chicago and Saint Louis railroads (Map: Indiana, C 3). It is the seat of Franklin College (Baptist), opened in 1834, and has fine county buildings. The city is in an agricultural region; its industrial establishments include a foundry, elevators, flour, planing, and saw mills, etc. Population, in 1890, 3781; in 1900, 4005.

FRANKLIN. A city and the county-seat of Simpson County, Ky., 133 miles south by west of Louisville; on the Louisville and Nashville Railroad (Map: Kentucky, E 4). It has the Franklin Female College and Franklin Military Institute. The industrial establishments include flouring-mills, a planing-mill, a woolen-mill, brick-works, etc. Population, in 1890, 2324; in 1900, 2166.

FRANKLIN. A town and the parish-seat of Saint Mary Parish, La., 100 miles west by south of New Orleans; on Bayou Teche, and on the Southern Pacific Railroad (Map: Louisiana, D 4). The bayou is navigable for steamers, and the town carries on a considerable trade in cotton, sugar, fruits, etc. There are several sugar and saw mills. Population, in 1890, 2127; in 1900, 2692.

FRANKLIN. A town in Norfolk County, Mass., including the village of Unionville, 27 miles southwest of Boston; on the New England Railroad (Map: Massachusetts, E 3). It has an almshouse, a public library, and Dean Academy, an endowed school for both sexes. Its manufactures include pianos, straw hats, and cotton, woolen, and felt goods. Franklin was originally a part of Wrentham, and was incorporated as a separate township in 1778. The government is administered by town meetings. Population, in 1890, 4831; in 1900, 5017.

FRANKLIN. A city in Merrimack County, N. H., 95 miles northwest of Boston, Mass.; at the confluence of the Pemigewasset and Winnepesaukee rivers, which here unite in the Merrimack, and on the Boston and Maine Railroad (Map: New Hampshire, H 8). Abundant water-power has contributed materially to the city's industrial importance. There are paper and pulp mills, hosiery-mills, foundries, and manufactures of needles, knitting-machines, woolen goods, boxes, etc. Franklin is famous as the birthplace of Daniel Webster, and has the New Hampshire Orphan's Home. It was incorporated as a town in 1828, and in 1895 received a city charter, now in operation, which provides for a mayor, elected annually, and a unicameral council. The city owns and operates its water-works. Population, in 1890, 4085; in 1900, 5846.

FRANKLIN. A city and the county-seat of Venango County, Pa., 123 miles by rail north of Pittsburg; on the Allegheny River, and on the Allegheny Valley, the Erie, the Western New York and Pennsylvania, and the Lake Shore and Michigan Southern railroads (Map: Pennsyl-

vania, B 2). It has a public library and two fine parks, besides several points of historic interest. The centre of the great oil region of the State, Franklin's chief interest is in oil, though there are also flouring-mills, machine-shops, brick-works, and manufactures of steel castings, tools, and oil-well supplies. Franklin was settled about 1753, and was incorporated in 1795. The government is administered under a special charter of 1868, subsequently amended, which provides for a mayor, elected annually, and a unicameral council. Population, in 1890, 6221; in 1900, 7317.

FRANKLIN. A town and the county-seat of Williamson County, Tenn., 20 miles south of Nashville; on the Harpeth River, and on the Louisville and Nashville Railroad (Map: Tennessee, E 5). It is the seat of the Tennessee Female College, opened in 1856. The town is the centre of a fertile agricultural region, and has several cotton-gins, and manufactures of carriages, flour, lumber, etc. Population, in 1890, 2250; in 1900, 2180. An engagement between the Federal General Granger and the Confederate General Van Dorn occurred here on April 10, 1863, the latter making the attack and being repulsed; and here, on November 30, 1864, was fought the famous battle of Franklin. See **FRANKLIN, BATTLE OF**.

FRANKLIN (from ML. *franchilanus*, from *franchus*, free). An English freeholder of former times, who held his lands of the Crown free from any feudal servitude to a subject superior. He is one of the characters described by Chaucer. In the course of time he lost his dignity, becoming a well-to-do yeoman. Consult: Chaucer, *Prologue to the Canterbury Tales*; Shakespeare, *Henry IV., Part I.* (Act ii., Scene 1, and *Winter's Tale* (Act v., Scene 11).

FRANKLIN, BATTLE OF. A sanguinary battle fought at Franklin, Tenn., on November 30, 1864, between a Federal army of about 25,000, under General Schofield, and a Confederate army of about 40,000, under General Hood. Early in November, 1864, General Schofield, acting under orders from Thomas, took command at Pulaski, Tenn., of a Federal force of about 25,000. On the 21st Hood advanced against this position, and Schofield gradually withdrew before him toward Nashville, under instructions to impede the Confederates until Thomas should have fully prepared himself for action. Confederate movements by the rear and by the right flank were balked by Schofield at Columbia and Spring Hill on the 24th and the 29th respectively, and by a rapid night's march, in which he passed by the sleeping Confederate army. Schofield reached Franklin at dawn of the 30th, and, in the absence of pontoon bridges, immediately set about improvising bridges for transferring his army and stores across the Harpeth River. He also threw up breastworks on the left bank to meet a possible Confederate attack, and stationed General Wagner, with two brigades, somewhat in advance, with instructions to withdraw behind the intrenchment on the approach of the Confederates, without awaiting a general attack. Meanwhile Hood, chagrined over the previous day's failure at Spring Hill, had come up, and at 4 P.M. ordered an attack. Wagner, imprudently delaying, lost heavily, and his men, enveloped by the Confederate advance, hastily retreated

through the Federal centre, which was soon thrown into great confusion. General Opdycke, without orders, threw his brigade into the resulting gap, and thus, by enabling the Federals to reform, saved the day. Thereafter until almost midnight the fighting continued, the Confederates making repeated and desperate assaults only to be beaten back each time with disproportionate loss by the Federals, under the immediate command of Gen. J. D. Cox, General Schofield being on the right bank of the river. During the night Schofield withdrew unmolested to Nashville, where he joined Thomas. The battle is notable for the remarkable gallantry of the Confederates and the stubborn bravery of the Federals. The Federal loss in killed, wounded, and missing was 2326; that of the Confederates, though not accurately known, probably exceeded 6000. Consult: Cox, *The Battle of Franklin* (New York, 1897); id., *The March to the Sea, Franklin and Nashville* (New York, 1882); Johnson and Buel (editors), *The Battles and Leaders of the Civil War*, vol. iv. (New York, 1887); and Nicolay and Hay, *Abraham Lincoln: A History*, vol. x. (New York, 1890).

FRANKLIN, BENJAMIN (1706-90). An American statesman, scientist, and author. He was born in Boston, Mass., January 17, 1706. His father, Josiah Franklin, emigrated to America about 1685, and took up the business of tallow-chandler. His mother, a second wife, was the daughter of Peter Folger, a leading settler, noted for his philanthropy and tolerance. Benjamin, the fifteenth of seventeen children, was named after his father's favorite brother, and, as the tenth son, was intended as the 'tithe for the ministry.' Either on account of poverty or an early perceived distaste on the boy's part, the theological idea was given up. After a year or more at candle-making in his father's shop, Benjamin was apprenticed to his brother James, a printer, and the founder of the *New England Courant*, one of the earliest papers in America. While in this office Franklin learned the trade well, read diligently, and found time to write pieces in the style of the *Spectator*, and even ballads, which he had published in the *Courant* anonymously. For some political opinions James Franklin was imprisoned a month and forbidden to publish his paper. For a while it appeared under Benjamin's name; but there was continual quarreling between the two brothers. At last the apprentice broke his indentures and slipped away by sea to New York. Finding no work there, he went on to Philadelphia, where he arrived friendless and almost penniless. Though only seventeen years old, he was a good printer and of pleasing address, and quickly found both friends and work. In 1725 Sir William Keith, the Governor, induced him to go to England to buy type for a printing shop of his own, promising him a letter which would give him aid in the way of money. Franklin reached England, found his patron's promises worthless, and had to shift for himself. For a year and a half he maintained himself as a printer, living a wild sort of life, and gaining some notoriety by a free-thinking pamphlet which he printed, but afterwards repudiated as immature. Returning to Philadelphia in 1726, he was clerk for a while in a newly started dry-goods shop. He soon got back to printing, however, first with his old employer, Keimer, and then in

an independent shop for which he furnished skill and energy and his partner the money. In 1729 Franklin got control of the *Pennsylvania Gazette*, which Keimer had started, and the excellence of the printing and the spirit of the writing won him a competence and high consideration throughout the Colonies. In 1730 he married Miss Deborah Read, the daughter of the man whom he had lodged with on his first coming to Philadelphia. From this time on he was engaged almost constantly in some sort of public activity, and his achievements were varied. In 1731 he began the Philadelphia Library, chartered in 1742, the first and model of the American system. *Poor Richard's Almanac* he first published in 1732, under the pseudonym of 'Richard Saunders,' and for twenty-five years his witty, worldly-wise sayings in this were very influential in molding the new American character. In 1736 he became clerk of the General Assembly, and the next year was appointed postmaster for Philadelphia. In 1743 he broached a plan for an academy, which was later adopted and developed into the University of Pennsylvania. In 1744 he founded the American Philosophic Society. During this period also he invented the excellent Franklin stove, led in the improvement of the city's lighting, paving, police, and fire departments, and yet found time to conduct the electrical investigations which have placed him in the rank of the great discoverers. In 1752 he made his celebrated experiment with the kite, which demonstrated the identity of lightning with electricity. Franklin's scientific views won their way through surprised incredulity into acceptance both in France and England. The degree of LL.D. was voted him by Oxford, Edinburgh, and Saint Andrews, and he became F.R.S. and was awarded the Copley gold medal in 1775.

In 1753 Franklin was appointed Postmaster-General for the Colonies. In 1754 he was commissioner from Pennsylvania at the Intercolonial Congress which met at Albany to take measures in view of the threatened French and Indian War, and he proposed a plan combining local independence with union. (See ALBANY CONVENTION.) It seems probable that if this plan had been followed many of the causes which led to the Revolution would have been avoided, and perhaps the Revolution itself. When the French and Indian War came on, Franklin assisted Braddock greatly, giving his personal security for supplies and transportation furnished by the Pennsylvania farmers. The descendants of William Penn, the proprietors of the Colony, refused to allow their private lands to be taxed for the support of the English troops, and in 1764 Franklin was sent to England to petition the Crown against this. This mission conducted satisfactorily, he remained in England as the leading representative for the Colonies. His influence in 1766 helped to secure the repeal of the Stamp Act; but he did not fully appreciate the depth of the feeling in America in regard to taxation, and when he urged the colonists to pay the later small tax on tea, he was roundly charged with lack of patriotism. In 1775, seeing war to be inevitable, he returned, and was immediately chosen a delegate to Congress. He was on the committee to draft the Declaration of Independence, and was one of the signers.

During the Revolutionary War Franklin represented American interests in Europe, and par-



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BENJAMIN FRANKLIN

FROM THE ENGRAVING BY MAX ROSENTHAL OF THE PORTRAIT BY C. W. PEALE

ticularly in France. His scientific reputation, his dignity of character, and charm of manner made him extremely popular in French literary, social, and political circles, and his wisdom and fertility of resource secured for the Government aid and concessions which no other man could possibly have obtained. He lent efficient aid to the operations of the American navy and especially of John Paul Jones. Against the vigorous opposition of Necker, his matchless diplomacy got for a country that was bankrupt and almost hopeless loans amounting to many millions of francs. After the defeat of Burgoyne, Franklin was received officially, and in 1778 he concluded a treaty of offensive and defensive alliance with France. In 1782 he signed the preliminary articles of peace, and the next year (September 3, 1783) he was one of the signers of the definitive Treaty of Paris.

In September, 1785, his request to be allowed to return home was granted by Congress; but he had scarcely reached Philadelphia before he was chosen a member of the Executive Council, and soon afterwards he took the position which now corresponds to the Governorship. In 1787 he was a member of the convention to form a national constitution, and in spite of his advanced age was vigorously active in the proceedings. He was deeply interested in all schemes of usefulness and philanthropy, and one of his last public acts was to sign a memorial to Congress, as president of the Pennsylvania Society for the Abolition of Slavery. The last two years of his life were spent in severe pain of body, but in activity of mind. He died April 17, 1790, and was buried in the graveyard of Christ Church, Philadelphia. Upon his death Congress passed resolutions of mourning, and the National Assembly of France, on the motion of Mirabeau, put on mourning for three days.

Franklin's greatest service to America was undoubtedly due to his skill in diplomacy. His public spirit and devotion were reinforced by powers of mind and wisdom that made him practically unrivaled. To his common sense, sagacity, and industry he added great firmness of purpose, a matchless tact, and a broad tolerance. In science, his electrical discoveries, with the invention of the lightning-rod, are very important, and besides these, many other discoveries and inventions are to be credited to him. His literary reputation rests chiefly on his unfinished *Autobiography*, a book which is an epitome of his life and character, expressed in wonderfully clear and simple style. His newspaper and his almanac were the organs through which he spread his practical morality and wisdom, and they and his letters reflect his distinctively American humor. He was never deliberately an author; all his writing was done with a practical aim, and derives its value largely from the accuracy with which it reflects his character. He was remarkably deficient in poetic imagination and in ability to appreciate the spiritual side of man's nature. For a while during his youth he was a skeptic, and he was never an orthodox Christian; but his attitude when he died was such that to-day he would have been classed with the 'liberal Christians.'

In person Franklin was about 5 feet 9 or 10 inches in height, and well built. His complexion was fair, his eyes gray, and his manners extremely affable and winning. None of his descendants

bear his name, the last who did so being William Temple Franklin, who died in 1823. There are many descendants of his daughter, who married a Mr. Bache.

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FRANKLIN, Sir JOHN (1786-1847). An Arctic explorer, born at Spilsby, Lincolnshire, England. His father had intended him for the Church, but giving way to the boy's strong desire to follow the sea, secured for him a midshipman's appointment in the navy in 1800. He was first attached to the *Polyphemus*, with which he served in the Baltic, and took part in the battle of Copenhagen, April 2, 1801. His next service was with the *Investigator*, which, under command of Captain Matthew Flinders, was sent to survey the Australian coast. In this expedition Franklin's aptitude for scientific study first attracted attention, his astronomical and nautical observations being of considerable value. Returning to England, he was assigned as signal officer to the ship-of-the-line *Bellerophon*, in which, in 1805, he participated in the battle of Trafalgar. In 1808 he became a lieutenant, and in 1814 accompanied the British expedition against New Orleans, in the attack upon which he was wounded. Franklin's career as an Arctic explorer began in 1818, with his appointment to the command of the *Trent*, a brig that had been fitted out to accompany Captain Buchan in the *Dorothea* in an attempt to sail to the north of Spitzbergen, and cross the Polar Sea by that route. The attempt proved a failure, but Franklin's scientific knowledge and enthusiastic interest in Polar explorations became known, and in the following year he was placed in command of an expedition, which was destined to cross overland from Hudson Bay to Rupert's Land, and explore the northern coast of the continent eastward from the Coppermine River, acting in conjunction, if possible, with Lieutenant Parry, who was dispatched with two vessels to Lancaster Sound. Franklin's party spent three winters in the north, suffered the greatest privations, traveled over 5500 miles, and added much to the geographical knowledge of the north coast-line of North America. On his return to England he was promoted to the rank of captain, and was elected a fellow of the Royal Society. In 1825 he was off again to the Arctic regions, descended the Mackenzie River to its mouth, near which he wintered, and then dividing his party, sent some of them under Dr. Richardson eastward as far as the Coppermine River, while he himself proceeded along the Alaskan coast westward as far as Point Beechey, in longitude 149° 37' west. He returned to England in September, 1827. In 1829 he was

knighted, and in recognition of his services to geographical science received the honorary degree of D.C.L. from Oxford, and the gold medal of the Geographical Society of Paris. From 1830 to 1833 Franklin commanded the *Rainbow* frigate on the Mediterranean station, and won the appreciation of the Greeks, and a decoration from King Otho for services rendered them during their war of liberation. From 1836 to 1843 Sir John was Lieutenant-Governor of Van Diemen's Land, now Tasmania, and the period of his administration was one of the greatest progress the colony had ever known. On his return to England he found that an expedition was being planned by the Admiralty to make another attempt to discover the Northwest passage. Sir John sought and obtained command of the proposed expedition. It consisted of the *Erebus* and *Terror*, with 138 officers and men, and left England on May 18, 1845, with the intention of sailing direct to Cape Walker, and thence southward and westward in the direction of Bering Strait, as far as the ice and land would permit. The ships were last seen on July 26, 1845, by a Scotch whaler in Baffin Bay. In the summer of 1847, in which Franklin had planned to return, as no word had been received from him, uneasiness began to be felt, and an expedition for his relief was planned in England. When the winter of 1847-48 passed without news from the expedition the uneasiness increased, and in the spring of 1848 began a remarkable series of relief and search expeditions from both England and the United States, numbering thirty-nine all told up to 1857, and involving an expenditure of over a million pounds sterling. In 1854 Dr. Rae, conducting a search party sent out by the Hudson's Bay Company, came across the first traces of the ill-fated expedition, but it was not until 1859 that the expedition sent out in 1857 by Lady Franklin (1792-1875), under Captain McClintock, decided the fate of Sir John and his comrades, and at the same time established the fact that he had actually achieved what he had set out for, the discovery of the long sought Northwest passage. From the brief records found by McClintock it was learned that, after ascending Wellington Channel, which separates North Devon and Cornwallis Island to latitude 77° N., and returning by the west side of Cornwallis Island, the ships had wintered, in 1845-46, at Beechey Island, on the southwest coast of North Devon (in latitude 74° 43' 28" N.); that in the fall of 1846 an attempt had been made to reach the North American coast by sailing through the channel which separates Prince of Wales and North Somerset Islands, but that progress had been arrested by heavy ice when within twelve miles of the north end of King William's Land, where the party remained all winter, and where on June 11, 1847, Sir John Franklin had died; and that the ships were abandoned there by Captain Crozier and the 105 survivors of the party, who on April 26, 1848, started southward over the ice for the Great Fish River, on the Continent, but never reached their destination. Franklin was promoted to be rear-admiral in 1852, five years after his death. Sir John Franklin published the results of his first two Polar expeditions under the titles *Narrative of a Journey to the Shores of the Polar Sea in the Years 1819-22* (1823), and *Narrative of a Second Expedition to the Shores of the Polar Sea in 1825-27* (with

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FRANKLIN, SAMUEL RHODS (1825—). An American naval officer, brother of Gen. W. B. Franklin (q.v.). He was born in York, Pa., entered the United States Navy as an acting midshipman in 1841, participated in the capture and occupation of Monterey, Cal., during the Mexican War, was assistant professor of ethics and English at the United States Naval Academy in 1854, and in September, 1855, became a lieutenant. During the Civil War he became lieutenant-commander in July, 1862, served in the Western Gulf Blockading Squadron in 1863, and later as assistant to Commodore Palmer at New Orleans in 1863-64, and in the spring of 1865 served on the staff of Acting Rear-Admiral Thatcher in Mobile Bay. In 1873 he was promoted to be captain. He was chief-of-staff to Admirals Case and Worden successively; served for a time in the European Squadron; was president of the board of examiners for the promotion of officers in 1877; was hydrographer to the Bureau of Navigation from 1877 to 1880; became a commodore in May, 1881; was superintendent of the Naval Observatory in 1884-85; was promoted to be rear-admiral in January, 1885; commanded the European Station from 1885 to 1887; and in 1887 retired from active service. In 1889 he was president of the International Marine Conference. He published *Memories of a Rear-Admiral* (New York, 1898).

FRANKLIN, STATE OF. See TENNESSEE and NORTH CAROLINA.

FRANKLIN, WILLIAM (1729-1813). A Colonial Governor of New Jersey. He was born in Philadelphia, and was a natural son of Benjamin Franklin, who acknowledged him and brought him up in his household. During King George's War, William served in the Pennsylvania line on the Canadian frontier, and became a captain before he was of age. In 1754 he was comptroller of the general post-office, and for a time was clerk of the provincial assembly. Going with his father to England, he was there admitted to the bar (1758), and in 1762 was appointed Governor of New Jersey. Now a Tory, though hitherto a Whig, his time-serving character disgusted the colonists. During the Revolutionary War he remained loyal to England, and was kept under surveillance by the patriots. He gave his word that he would not leave the province; but in consequence of summoning a meeting of the old colonial assembly, he was arrested and sent to Connecticut, and kept a prisoner for two years. In November, 1778, he was exchanged and took refuge in New York. In 1782 he went to England, where he died. His political course caused an estrangement between him and his father, though later they were partially reconciled.

FRANKLIN, WILLIAM BUEL (1823-1903). An American soldier, prominent on the Federal side in the Civil War. He was born at York, Pa., graduated at West Point in 1843, and for the next three years was engaged in topographical work.

In the Mexican War he accompanied General Wood on his march through Coahuila. He subsequently was assistant professor of natural and experimental philosophy at West Point from 1848 to 1852, and thereafter until the outbreak of the Civil War was engaged on various engineering works of importance, becoming chief of the Construction Bureau of the United States Treasury Department in March, 1861. On May 17, 1861, he was promoted to be brigadier-general of volunteers, in which capacity he served in the first battle of Bull Run, and commanded successively a division and the Sixth Army Corps of the Army of the Potomac in the Peninsular campaign under General McClellan. On June 30, 1862, he was brevetted brigadier-general in the regular service, and on July 4th was promoted to be major-general of volunteers. He subsequently commanded the Sixth Corps of the Army of the Potomac in the Maryland campaign, being in command in the battle of Crampton's Gap, and participating in the battle of Antietam; and commanded the left grand division of the Army of the Potomac in the Rappahannock campaign, participating as such in the battle of Fredericksburg, his conduct in which caused his temporary relief from active service. He then served in the Department of the Gulf, where for some months he commanded the Nineteenth Army Corps, and the troops in western Louisiana, and on April 8, 1864, was wounded in the battle of Sabine Cross Roads. From December, 1864, to November, 1865, he was president of the board for retiring disabled officers, at Wilmington, Del. On March 13, 1865, he was brevetted major-general in the regular army. He resigned from the volunteer service on November 10, 1865, and from the regular army on March 15, 1866. Subsequently he became vice-president of the Colt's Firearms Manufacturing Company at Hartford, Conn., in November, 1865; was president of the board of managers of the National Home for Disabled Volunteer Soldiers from 1880 to 1899; and in 1889 was commissioner-general of the United States to the Paris Exposition.

FRANKLIN, WILLIAM SUDDARDS (1863—). An American physicist and electrical engineer, born at Geary City, Kan. He graduated at the University of Kansas in 1887. After further studies in Germany and at Harvard University, he was appointed assistant professor of physics at the University of Kansas (1887). From 1892 to 1897 he was professor of physics and electrical engineering at Iowa State College, and in 1897 was appointed to the same chair at Lehigh University. His publications include *The Elements of Physics*, and *The Elements of Alternating Currents*.

FRANKLIN AND MARSHALL COLLEGE. An educational institution under the care of the Reformed Church, established by the union of Franklin College and Marshall College. Franklin College was organized at Lancaster, Pa., in 1787, and named in honor of Benjamin Franklin, one of its benefactors; Marshall College, named after John Marshall, was established by the Reformed Church at Mercersburg, Pa., in 1836, in connection with its theological seminary. In 1853 the two institutions were consolidated at Lancaster under a new charter. The theological seminary is affiliated with the college,

as is also a preparatory academy. The value of the college buildings and grounds, including Science Hall, erected at a cost of \$70,000, is estimated at \$210,000; the endowment is \$200,000, and the annual income nearly \$30,000. Degrees are conferred in the arts and in divinity. In 1902 the student enrollment was over 300, of whom one-half were in the preparatory department.

FRANKLIN COLLEGE. A Baptist educational institution founded at Franklin, Ind., in 1834. The college offers courses in letters, science, and the humanities, leading to appropriate degrees. The student enrollment in 1902, including the preparatory department, was 200. At the same time the total value of the college property was over \$400,000 of which somewhat more than one-half represented productive funds.

FRANKLIN INSTITUTE, OF THE STATE OF PENNSYLVANIA, FOR THE PROMOTION OF THE MECHANIC ARTS. A learned institution at Philadelphia, Pa., established in 1824 for the purpose of disseminating knowledge of the arts and sciences, and combining in one organization features of the Mechanics' Institutes and of the exclusive scientific societies. The objects of the Institute are attained by means of lectures, reports, a journal, libraries, exhibitions, and school instruction. The lectures, originally giving systematic courses of instruction, now have the object of presenting the latest advances in art and sciences, in the form of popular lectures and of strictly technical discussions before the sections into which the Institute is divided. In 1834 a volunteer committee was formed to examine and report on new machines, inventions, and discoveries. The committee is now elective and consists of 60 members, whose labors have given a notable reputation to the Institute. The publication of a Journal was begun in 1826, and has continued uninterruptedly. It is issued monthly and contains the record of the Institute's work and contributions relating to the growth of science and American industries. The library, devoted exclusively to science and the useful arts, contains about 55,000 volumes, 38,500 pamphlets, besides maps, charts, and photographs. It is the public depository of the Congressional district, and has important collections of American, British, French, German, Swiss, Russian, and Austrian patent records, and complete series of reports on public works. In 1824 the Institute held the first exhibition of American manufactures, and has since held 29 exhibitions, the last in 1899. It grants medals, premiums and certificates for notable inventions. A school of mechanical and architectural drawing was established in 1824 and still exists. There are also night-schools of machine design and naval architecture. A school for instruction in English and ancient and modern languages was established in 1826, and became the model on which the Central High School was founded. It was abandoned when the public high-schools were established. Membership in the institution is open to all persons of legal age on payment of yearly dues. Its building stands at 15 South Seventh Street.

FRANKLINITE. An iron-black, slightly magnetic mineral with a metallic lustre, consisting of ferric and manganic oxides in combination with ferrous, manganous, and zinc oxides. It crystallizes in the isometric system, but is

found both crystallized and massive. In Germany it is also found in the form of cubic crystals, but it occurs chiefly in Sussex County, N. J., at Franklin Furnace, Mine Hill, and at Sterling Hill, being found in veins of limestone in zinc-mines. Owing to the manganese that it contains, it is used as an ore for making Bessemer steel.

FRANKLIN'S TALE, THE. One of Chaucer's *Canterbury Tales*. It narrates the adventures of the faithful Dorigen, as they are recounted in Boccaccio's *Decameron*, in the fifth story of the tenth day, although the franklin claims his story is taken from a Breton lay. The narrator himself is a jolly open-handed ex-sheriff and knight of the shire.

FRANKMARRIAGE (*liberum maritagium*). A species of estate tail existing by the common law of England. It arose where a man, on the marriage of his daughter or other female relative, gave lands to the bridegroom, with a provision limiting the inheritance to the issue of the marriage. It was, therefore, a form of fee tail special. This tenure was called *liberum maritagium*, to distinguish it from other species of estate tail. Four things were necessary to a gift in frankmarriage: (1) That it must be in consideration of a marriage, but it might be as well after as before a marriage; (2) that the woman with whom it is given be of the blood of the donor; (3) that the donees should hold of the donor (hence a gift in frankmarriage by a subject became impossible after the statute *quia emptores*); (4) that the donees should hold for four generations. Therefore a reservation of a remainder to a stranger to take effect within four generations was a void limitation upon a gift in frankmarriage.

FRANK-PLEDGE. An ancient principle of English law, prevailing before the Norman Conquest, whereby the members of every tithing or community of freemen were responsible for the good conduct of each other. This responsibility consisted in every ten men in a village being answerable each for the others, so that if one committed an offense, the other nine were liable for his appearance to make reparation. Should the offender abscond, the tithing, if unable to clear themselves from participation in the crime, were compelled to make good the penalty. This law has been ascribed to Alfred the Great; but it would appear to have been in existence at a much earlier period. Mr. Hallam observes: "The peculiar system of frank-pledges seems to have passed through the following very gradual stages. At first, an accused person was bound to find bail for standing his trial. At a subsequent period, his relations were called upon to become securities for payment of the compensation and other fines to which he was liable; they were even subject to be imprisoned until payment was made, and this imprisonment was commutable for a certain sum in money. The next usage was to make people already convicted, or of suspicious repute, give securities for their good behavior. It is not till the reign of Edgar that we find the first general law, which places every man in the condition of the guilty or suspected, and compels him to find a surety who shall be responsible for his appearance when judicially summoned. This is perpetually repeated and enforced in later statutes during his reign and that of Ethelred.

Finally, the laws of Canute declare the necessity of belonging to some hundred and tithing, as well as of providing sureties." (*Middle Ages*, ii. 80.)

The court of frank-pledge, or court leet, was a court of record held once in the year, within a particular hundred, lordship, or manor, before the steward of the leet. The business of this court was to present by jury all crimes committed within their jurisdiction, and to punish all trivial misdemeanors. This court has practically fallen into desuetude, and the business is discharged by the justices of the peace at general and petty sessions. Originally, the business of the court of frank-pledge was confined to taking securities or free pledges for every person within the jurisdiction; but this practice having fallen into disuse, the court gradually acquired a criminal jurisdiction concurrent with that of the sheriff's tourn. See COURT BARON; COURT LEET; MANOR.

FRANKS, THE. The name borne by a confederation of Germanic tribes which appeared on the lower and middle Rhine in the third century after Christ, and subsequently overthrew the Roman power in Gaul. Though the name is first encountered about the year 240, the individual tribes constituting the confederation were known to the Romans as early as the time of Augustus. Chief among these were the Sali, the Sigambri, the Chamavi, the Bructeri, the Ampsivarii, the Chatti, the Tubantes, the Usipetes, and the Batavi. Their first appearance within the Empire was in the year 253, and as early as the beginning of the fourth century they had established themselves in what is now Brabant. Quite early they became separated into two distinct groups—the Salian Franks, who dwelt on the lower stretches of the Rhine and its affluents, and whose name is supposed to have been derived from the River Yssel (Isala or Sala), and the Riparian Franks or Riparii, whose territories lay on both banks of the Rhine along its middle course. The Salian Franks were defeated by Constantine the Great in 306, and by Julian in 358, and became the allies of the Romans, who intrusted to them the defense of the border. During the first decade of the fifth century, the Salian Franks, carried away by the onrush of the other Germanic nations into Gaul, turned upon the Roman provinces, captured Treves, and soon became the masters of a large extent of territory on the Meuse and the Scheldt, acknowledging, however, the suzerainty of the Romans. They fought under Aëtius against Attila on the Catalaunian Fields, in 451, and remained on friendly terms with the Romans till after the fall of the Western Empire.

The real greatness of the Franks dates from the Salian Clovis or Chlodwig (481-511), a descendant of the fabled Meroveus, who in 486 overthrew the Roman patrician Syagrius at Nogent, near Soissons, and ten years later vanquished the powerful confederacy of the Alemanni. The Burgundians, the Visigoths of Aquitaine, and the Riparian Franks were likewise subjugated and the limits of the Frankish kingdom were extended from the Pyrenees to Friesland, and from the Atlantic to the Main. Under the influence of his wife, Clotilda, Clovis had accepted Athanasian Christianity in 496, and in his campaigns against the Arian Goths and Burgundians he acted in part as the champion of orthodoxy, thus marking the beginning of the close connection between the Frankish monarchy and the Roman Catholic

Church. After the death of Clovis the kingdom was divided among his four sons. Theodoric ruled at Metz, Chlodomer at Orleans, Childebert at Paris, and Clotaire at Soissons. Thuringia, Burgundy, and Provence were acquired before 558, in which year Clotaire became sole ruler of all the Frankish lands. After Clotaire's death, in 561, the kingdom was again divided among his four sons. Austrasia, with a population predominantly Germanic, fell to Sigebert, who made his capital at Metz; Neustria, comprising part of the Gallo-Roman Provinces, was assigned to Chilperic, with his capital at Soissons; Aquitaine fell to Charibert; Burgundy, with its capital at Orleans, was ruled by Guntram. In 567 Charibert died, and his dominions were divided among his brothers. The period that follows is one of internecine strife among the descendants of Meroveus, marked by the foulest crimes and excesses, and resulting in the decay of the Merovingian power. In the prevailing anarchy the great nobles who had been intrusted with the government of the provinces seized the opportunity to make themselves virtually independent and their offices hereditary. (See BRUNHILDA; FREDEGONDA; MEROVINGIANS.) Clotaire II. in 613 once more reunited the lands of the Frankish Crown; but the kings from this time ceased to exercise any influence, and the real power passed into the hands of the great officers of State, the chamberlain, the keeper of the seal, chief of all the mayor of the place (*mayor-domus*). This office existed in all three of the Frankish kingdoms, but it was in Austrasia that a powerful family arose which held exclusive possession of the mayoralty for more than a hundred years, ruling as monarchs in fact, if not in appearance. This was the race of the Carolingians (q.v.). Pepin of Landen was *mayor-domus* of Austrasia under Dagobert II. (628-38), and was succeeded by his son Grimoald, who died in 656. Thirty years of confusion followed, during which the Frankish lands were repeatedly portioned out and reunited, until, in 687, Pepin of Heristal, the Austrasian mayor of the Palace, overthrew the forces of Neustria and Burgundy in the battle of Testry, and thenceforth ruled as the *mayor-domus* of a united Frankish kingdom. His son, Charles Martel (714-741), extended the frontiers of the kingdom in the east, and in 732 repelled the tide of Saracen invasion in the battle of Tours or Poitiers. Charles's son, Pepin the Short, ruled in conjunction with his brother Karlmann till 747; and after that, alone. In 751 Childeric III., the last of the Merovingians, was deposed, and Pepin ascended the throne with the consent of the Pope. Under Charles the Great (q.v.), the son of Pepin, the Frankish power attained its greatest development. Germans and Latins were united under Charles's sway, which extended from the Ebro to the Eider, and from the North Sea to Croatia and Slavonia. The most powerful monarch in Europe, he became also the secular head of the Church, continuing in this manner the tradition of the old Roman Empire. His coronation as Roman Emperor took place in 800. Charles's successor, Louis the Pious, showed himself unequal to the task of holding together the huge empire which his father had created. Civil strife disturbed the last years of his reign. In 841, the year after his death, his sons, Lothair, Louis the German, and Charles the Bald, fought the decisive battle of

Fontenay; and two years later, at Verdun, the Frankish Empire was partitioned among them. (See VERDUN, TREATY OF.) This marks the virtual dissolution of the Frankish monarchy, though Charles the Fat succeeded for a moment (884-87) in reëstablishing the Empire. Its place is henceforth taken by the nations of France, Germany, and Italy.

The rôle played by the Franks in the history of Europe was one of capital importance. Of all the barbarian peoples they showed themselves the most capable of assimilating the Roman culture of the countries which they conquered. Civilized, they became in turn the civilizers of the German stocks which had remained in their homes beyond the Rhine. Charles's campaigns against the Saxons carried Christianity into Northern Germany. The elaborate machinery of government which he set up within the Empire established order and respect for the law in Europe, after such a manner as had not been known since the best days of the Roman Empire. Unlike the absolutism of Rome, however, the Frankish monarchy knew how to reconcile Imperial power with the rights of the subjects, as shown in the retention of the national and local assemblages of freemen or representatives of freemen. Frankish law influenced profoundly the legal systems of all the nations of Western and Central Europe. (See SALIC LAW.) Most important of all, however, was the close connection between the Frankish monarchy and the Catholic Church. The donations of Pepin and Charlemagne and the establishment of a new Roman Empire may be said to have determined the general features of the political history of Europe during the Middle Ages. Consult: Perry, *The Franks* (London, 1857); Sismondi, *The French Under the Merovingians* (London, 1850); Church, *Beginning of the Middle Ages* (New York, 1877); Emerton, *Introduction to the Study of the Middle Ages* (Boston, 1888); Guizot, *History of Civilization* (Eng. trans. New York, 1861); Thierry, *Récits des temps mérovingiens* (Paris, 1882); Favre, *L'empire des Francs* (Paris, 1888); Fustel de Coulanges, *Histoire des institutions politiques de l'ancienne France* (Paris, 1888-89); Arnold, *Frankische Zeit* (Gotha, 1883); Waitz, *Deutsche Verfassungsgeschichte* (Kiel, 1882).

FRANKS, Sir AUGUSTUS WOLLASTON (1826-97). An English archaeologist. He was born in Geneva, Switzerland, and was educated at Eton and at Trinity College, Cambridge. He was long associated with the British Museum as custodian of the department of British and mediæval antiquities and ethnography. During the last five years of his life he was president of the Society of Antiquaries. His knowledge of Oriental ceramics was most extensive, and he gave much porcelain and pottery to the British Museum. In the department of Renaissance art he was also an acknowledged authority. His publications include: *Book of Ornamental Glazing Quarries* (1849); *Examples of Ornamental Art in Glass and Enamel* (1858); *Himyaritic Inscriptions from Southern Arabia* (1863); *Catalogue of Oriental Porcelain and Pottery* (1876-78); *Japanese Pottery* (1880); and *Catalogue of a Collection of Continental Porcelain* (1896).

FRANSCINI, frân-shĕ'nĀ, STEFANO (1796-1857). A Swiss political economist and statistician, born at Bodio in the Canton of Ticino.

In 1830 he was elected Chancellor of his canton, and he was reelected in 1844. In 1848 he was elected member of the Federal Council. In his works *Statistica della Svizzera* (1828) and *Statistica della Svizzera italiana* (1837-39) he may be said to have laid the foundation of statistical science in Switzerland.

FRANSECKY, fräns'ki, EDUARD FRIEDRICH VON (1807-90). A German general, born at Geden, Hesse. He entered the Prussian Army in 1825, and in 1843 was called to the general staff. He fought with distinction in the Danish War of 1848, and in the Austro-Prussian War of 1866, where by his obstinate resistance against powerful odds he helped to decide the engagement at Münchengrätz and also took a prominent part in the battle of Sadowa. As commander of the Second Army Corps during the War of 1870-71, he succeeded, after a forced march, in reaching the battlefield of Gravelotte in time to attack the heights of Point-du-Jour with the First Army, an action which contributed materially toward deciding the battle. On December 1st he received command of the German forces between the Seine and Marne rivers, and on the following day repelled General Ducrot's attempt to break through the lines at Champigny and Brie. He was the chief adviser of Manteuffel in the operations of that general against the Army of the East under Bourbaki, and after numerous engagements compelled the French to retreat into Switzerland. In recognition of his services he received a handsome sum from the Government, and was appointed Governor of Berlin in 1879. He resigned in 1882.

FRANTZ, fränts, KONSTANTIN (1817-91). A German publicist. He was born near Halberstadt, was educated at Halle and Berlin, and after acting as private secretary in the Berlin Foreign Office was attached to the consular service in Spain for three years (1853-56). The central idea expressed in his numerous works is the ultimate and inevitable confederation of Europe, with the Teutonic peoples as a nucleus. The principal works of this gifted writer include: *Der Föderalismus als das leitende Princip für die soziale, staatliche und internationale Organisation* (1879); and *Die Weltpolitik* (1883).

FRANTZIUS, frän'tsi-us, ALEXANDER VON (1821-77). A German explorer. He was born at Danzig, and became established as a physician at Alajuela, and later at San José, Costa Rica, where he made extensive explorations, the results of which he published upon his return to Germany. His works include: *Beiträge zur Kenntnis der Vulkane Costa-Ricas* (1861); *Das rechte Ufer des San Juanflusses* (1862); *Der südöstliche Teil von Costa-Rica* (1869); *San Salvador und Honduras im Jahre 1576* (1873). Several of his works have been translated into Spanish by Cortés, Carazo, and Twilight.

FRANZ, fränts, JULIUS (1824-87). A German sculptor. He was born in Berlin, and was taught by Wichmann and Fischer at the Academy of Art in that city. After gaining valuable experience in the studios of Fischer, Wredow, Tieck, and Rauch he produced his first important work, "Shepherd and His Dog in Conflict with a Lion" (1851, in the Sans-souci Garden near Potsdam). Many of his works are decorative rather than artistic in character. Among the colossal groups executed by him in sandstone may be mentioned: "America

and England" (Berlin Börse); "Prussia and Hanover," after a design by F. A. Fischer (Belle-Allianceplatz, Berlin).

FRANZ, ROBERT (1815-92). A celebrated German composer, born at Halle. The family name was originally Knauth, but in 1847 it was officially changed. In spite of the opposition of his parents, Robert early began to study music, and when twenty years of age went to Dessau, where he was for two years a pupil of Friedrich Schneider. Upon his return to Halle he devoted himself to the study of the great masters of music, especially Bach, Handel, and Schubert; but it was not until 1843 that his first collection of songs was published. Schumann, Liszt, and Mendelssohn praised them highly, and this success gained for him a position as organist at the Ulrichskirche. He later became conductor of the Singakademie, and director of music at the university. In 1868 Franz was compelled to resign his positions on account of deafness and ill health, and he was only kept from poverty by a series of benefits given by his friends in Germany and America. His arrangements of some of Handel's and Bach's works are standard, but it is as a song-composer that his fame is assured. His two hundred and fifty-seven songs, which are written for solo voice and piano accompaniment, are similar in style to those of Schumann and of Schubert, and are scarcely excelled by theirs. In addition to his songs he composed a number of sacred works, the best of which are his six chorals. He died in Halle. There are a number of biographical sketches of Franz by Ambros, Saran, Schäffer, Schuster, etc., of special note being that by Waldmann, *Gespräche aus zehn Jahren* (Leipzig, 1895).

FRANZ-DREBER, fränts' drä'bër, See DREBER, HEINRICH FRANZ.

FRANZÉN, frän'-tsan', FRANS MICHAEL (1772-1847). A Swedish author and poet, born at Uleåborg (Finland). While professor at the Academy of Åbo, he published his first volume of poems (1794). After the annexation of Finland to Russia (1809), he lived in Sweden, and became successively pastor at Örebro, and Bishop of Hernösand (1831). He excelled in lyric poetry, particularly religious songs, some of which are accounted among the best in the Swedish language. His works include: *Skaldestycken* (1824-61), *Stamlade Dikter* (1867-69), and *Valda Dikter* (1871), lyric poems; *Gustav Adolf i Tydskland* (1817-18), an incomplete national epic; *Christopher Columbus* (1831); *Emili eller en afton i Lappland*; *Svante Sture*; and *Lappflickan i Kungsträdgården*. His *Minnesteckningar* (1848-60), a collection of biographies of prominent Swedes, are models of their kind.

FRANZENSBAD, fränts'ens-bätt. A fashionable watering-place in Bohemia, Austria, situated about 1450 feet above the sea, in a somewhat barren, rolling country, four miles northwest of Eger (Map: Austria, C 1). The town is pleasantly laid out with shady streets and charming parks, and is fully equipped as a health resort. It is chiefly famous for its chalybeate and saline springs, impregnated with carbonic-acid gas. They are twelve in number, and are considered especially efficacious for anæmia and diseases of women. The mud baths (*Moorbäder*), formed by mixing warm mineral water with pulverized mineral earth, are employed in cases of rheuma-

tism and skin diseases. Population, in 1890, 2400; in 1900, 2330. The waters of Franzensbad were mentioned as early as the sixteenth century, and the town was founded by Francis I. in 1793.

FRANZENSKANAL, fränts'en - kä - näl, or BÁCSEK CANAL. A canal of Hungary, since 1801 connecting the Danube and the Theiss. It is 67 miles long, 65 wide, and 6½ feet deep.

FRANZ-JOSEF LAND, fränts'yö'zëf lânt. An Arctic archipelago, north of Nova Zembla, and east of Spitzbergen, lying north of Asia, mainly between latitudes 80° and 82° N., and longitudes 42° and 63° E. (Map: Arctic Regions, G 4). It was discovered in 1873 by the Austro-Hungarian expedition under Weyprecht and Payer, and named in honor of their Emperor. It is a group of about sixty small islands separated by fiords, channels, and sounds. As far as explored, the greatest distance across the archipelago is about 220 miles along the parallel 80½ N., and its greatest breadth is 165 miles along the fifty-ninth meridian. The Queen Victoria Sea lies to the north and west. The western group of islands in the archipelago is called Alexandra Land. Separated by the British Channel on the east, lies the group known as Zichy Land. Still farther east, beyond Austria Sound, lies the Wilczek Land group. Franz-Josef Land is a tableland, generally from 400 to 500 feet above the sea. In numerous places, however, the altitude reaches 1000 feet, and in Wilczek Land about 2600 feet. The surface is formed of basaltic rocks which protrude occasionally through the thick covering of ice and snow. Beneath these layers of rock are strata of soft shales, clay, sandstones, and marl. Fossil plants and animals have been found in these lower strata. Glaciers abound.

The absence of the sun from the middle of October to the last of February sufficiently marks the polar character of the climate. The average temperature in the coldest month is about -20° F., and of the warmest month 35° F. The degree of cloudiness varies from about 50 per cent. in winter to 85 per cent. in summer. Dense fogs often prevail. The winds are chiefly from the east or west, with a marked tendency to blow from the north. Violent gales continue for days at a time. There are magnificent auroral displays. The chief plants of Franz-Josef Land are lichens, mosses, and grass. The willows, heaths, and sedges usually found at even this high altitude in other countries are here lacking. Of flowering plants, the chief are the yellow and white poppy, cresses, *Draba alpina*, scurvy-grass, *Cerastium alpinum*, *Saxifraga*, Alpine foxtail grass, and *Poa cenesia*. The vascular cryptogams are lacking. Few species of hepaticæ are present. *Marchantia polymorpha* (the common liverwort of Europe and America) being the most prominent. The mosses in numerous places form thick carpets, with a brilliant coloring of green and yellow and bright crimson. Sea-algae are rare, but fresh-water algae are numerous. The lichens grow in profusion up to 600 feet above the sea, and are found at heights of 1000 feet. The variety of mammalian fauna is very limited. Polar bears are relatively plentiful; a few blue foxes are to be seen; walruses are fairly abundant. The saddle-back and ground seals are scarce, but the ringed seals, or 'floe-rats,' are quite common. The avian fauna has been care-

fully studied. It includes the snow-bunting, cider-duck, purple sandpiper, various gulls (the glaucus, kittiwake, and ivory), Richardson's skua, Brünnich's and black guillemots; and the little auk, Brent goose, snowy owl, and Arctic tern. Only half a dozen species of insects have been found.

Franz-Josef Land has been very prominent in the later history of Arctic explorations. It was near Cape Flora that Nansen and Jackson met on June 17, 1896. Wellman was in Franz-Josef Land in 1899; the Duke of the Abruzzi and Prince Amadeus of Savoy explored in this region in 1899-1900; and Cagni reached from here the highest point north that had been made by the end of the nineteenth century. Consult: Weyprecht, *Sulla spedizione polare austro-ungarica* (Triest, 1875); Payer, *New Lands Within the Arctic Circle* (Eng. trans. London, 1876); Greely, *Handbook of Arctic Discoveries* (New York, 1896); Jackson, *A Thousand Days in the Arctic* (New York, 1899). See ARCTIC REGION and POLAR RESEARCH.

FRANZOS, frän-tsös', KARL EMIL (1848-1904). A German journalist and novelist of Jewish descent, noted for his pen pictures of Eastern European life. He was born in Podolia, October 25, 1848. His first volume, *Aus Halb-Asien* (1876), won European success for its brilliant descriptions of life in Galicia, Rumania, and Southern Russia. It was translated into several languages. This was followed by *Vom Don zur Donau* (1878), and many stories, usually of the same scenes that maintained his reputation. Of these the more noteworthy are: *Die Juden von Barnow* (1879); *Ein Kampf ums Recht* (1882); *Tragische Novellen* (1886); and *Der Wahrheit-sucher* (1894).

FRAPAN, frä'pä'n', ILSE. The pseudonym of the German novelist and poet Ilse Levien (q.v.).

FRAPOLLI, frä-pöl'le, LODOVICO (1815-78). An Italian patriot and diplomat, born at Milan. He was forced to enter the Austrian Army in 1831, but left it as soon as he came of age. In 1840 he went to France and studied at the School of Mines. He wrote on the origin and formation of the earth, and on the geology of Finisterre and of the Scandinavian countries and Germany, and was made secretary of the French Geological Society. He took part in the fighting at Paris in February of 1848, and later in the year went to Milan, and held office in the War Ministry of the Provisional Government in Lombardy. Then he was Ambassador in Paris of Lombardy, Tuscany, and the Roman Republic in quick succession, but left the French capital after the capture of Rome; lived in Switzerland, and devoted himself to geology. He was Minister of War under Farini in Modena, but retired, and in 1860 joined Garibaldi's expedition to Sicily, and entered Naples with him. He was an Italian Deputy from 1860 to 1874, an extreme member of the Republican Party. He was a leader of the Italian Free Masons, and became Grand Master in 1869. In 1870 he again fought under Garibaldi.

FRAS, or **FRAZ**, JACOB. See VRAZ, STANKO.

FRASCATI, fräs-kä'tä. A beautiful summer resort in Central Italy, 985 feet above the sea, on the north slope of the Alban Mountains (q.v.), 15 miles southeast of Rome (Map: Italy, M 2).

It is the residence of a cardinal bishop, and has two churches that were mentioned in monastic records as early as the ninth century. In the Cathedral of San Pietro, dating from 1700, is a memorial tablet to Charles Edward Stuart, the Young Pretender of England, whose body, buried here in 1788, now lies in Saint Peter's. Famous estates are the Villa Conti; the Villa Piccolomini, where in the sixteenth century Cardinal Baronius wrote his *Annales*; the Villa Aldobrandini, built by Giacomo della Porta for Clement VIII.'s nephew, which contains paintings by the Cavaliere d'Arpino; and the sixteenth-century Villa Tusculana or Ruffinella, the property once of Lucien Bonaparte and afterwards of Victor Emmanuel II. Frascati first became important after the destruction of Tusculum (q.v.) in 191. Population of commune, in 1881, 7500; in 1901, 9915.

FRASER, ALEXANDER CAMPBELL (1819—). A Scottish philosopher. He was born in County Argyll, was educated in Edinburgh University, and from 1846 to 1856 was professor of logic in New College, Edinburgh. After contributing extensively to the *North British Review*, he became the editor in 1850, and held the position until 1857. In 1856 he succeeded Sir William Hamilton as professor of logic and metaphysics in the University of Edinburgh. Professor Fraser's philosophical work treats the three great problems—the material world, man, and God—in their mutual relations. The first is discussed in his *Collected Edition of the Works of Bishop Berkeley, with Annotations and Dissertations* (1871), and in a *Biography of Berkeley* (1880); the second in his *Annotated Edition of Locke's Essay on the Human Understanding, with Prolegomena Critical and Historical* (1894); and the three in his collected lectures on the *Philosophy of Theism* (1896) and his *Biography of Thomas Reid* (1898). He steers a middle course between extremes of agnosticism and idealism by a practical faith in the divine order of a universe incompletely interpretable.

FRASER, ALEXANDER MACKENZIE (1756-1809). A British general. He was educated at Aberdeen, and after a few years in the banking house of Forbes and Company, in Edinburgh, accepted (1778) a commission in the Seventy-third Highlanders. He served in the defense of Gibraltar, and as recruiting officer; and retired from the army in 1784, when he married Helen Mackenzie. In 1793 he was commissioned major in the Seventy-eighth Highlanders. He was sent to Guernsey, and in the following year to Flanders; covered Abercrombie's retreat, and distinguished himself in the sortie from Nimeguen and at Geldermalsen (1795). In 1796 he served at the Cape of Good Hope, and a year later went to India, where he campaigned against the Mahrattas. When he returned to England, he was elected to Parliament, and received the grade of major-general (1802). In the next year he inherited property from his aunt and mother, and took the name Fraser in addition to his own. After service in England, Hanover, and with Henry Edward Fox (q.v.) in Sicily, he was chosen by Fox to command an expedition to get control of Egypt; but fared very badly at Rosetta, after capturing Alexandria, and had to return to Sicily. Sent to Portugal (1808), he advanced with Moore into Spain; showed great military ability in the retreat

through Galicia and at Corunna; and was made lieutenant-general. In the following year he sickened while on the Walcheren expedition, and died soon after his return to England. He was popular as well as able.

FRASER, CHARLES (1782-1860). An American artist. He was born in Charleston, S. C. He practiced law for ten years to acquire the means of continuing his art, and eventually was very successful as a miniature painter. He painted Lafayette's portrait in 1825, and the portraits of many prominent citizens of South Carolina, and also produced some landscape and genre pictures. He wrote *Reminiscences of Charleston* (1854), and contributed to various periodicals.

FRASER, DONALD (1826-92). A Scottish minister, born at Inverness. He graduated at the University of Edinburgh in 1842, and after studying theology at Knox College, Toronto, and at New College, Edinburgh, held pastorates in Montreal, Inverness, and at the Marylebone Presbyterian Church, London (1870-1892). His works include: *Synoptical Lectures on the Books of the Holy Scriptures* (1871-76); *The Church of God and the Apostasy* (1881); *Life of Thomas Chalmers* (1881); *The Speeches of the Holy Apostles* (1882); *Seven Promises Expounded* (1885); and *Sound Doctrine* (1892).

FRASER, JAMES (1818-85). An English prelate, born at Prestbury, Gloucestershire. He was educated at Lincoln College, Oxford; from 1840 to 1860 was fellow of Oriel, where he was tutor in 1842-47 and sub-dean and librarian in 1844-47, and from 1847 to 1860 was rector of Cholderton, Wiltshire. In 1858 he received the appointment of assistant-commissioner to the Royal Commission on Education, and in that capacity made in 1859 a valuable report on the district assigned to him. He was rector of Upton Nervet, Berkshire, from 1860 until 1870, and greatly developed that parish; in 1865 visited the United States and Canada as a commissioner on education; rendered a second noteworthy report in the year following (*Report on the Common School Systems of the United States and of the Provinces of Upper and Lower Canada*, 1866); and in 1870 was consecrated Bishop of Manchester. His administration of this diocese, undertaken amid very grave difficulties and carried on with remarkable activity, resulted in the establishment of one hundred and nine new district parishes, the consecration of ninety-nine new churches, and the introduction of an admirable system of machinery for diocesan work. At the same time, his interests were so wide as to gain the esteem of all Nonconformists, including the Greek and Jewish congregations at Manchester, and to obtain for him the familiar title of "bishop of all denominations." Theologically he was of the old High Church school and opposed to the Tractarian movement. In his charities he was liberal. He published nothing beyond his reports as Parliamentary commissioner and a few addresses and sermons. A volume of his sermons, under the editorship of J. Doyle, appeared in 1888. Consult: *Memoir* by Hughes (1887); also Arnold, *Our Bishops and Deans*, vol. ii. (1875).

FRASER, MARY CRAWFORD (Mrs. HUGH). An English author, the daughter of Thomas Crawford the sculptor, and sister of Marion Crawford the novelist. She was born in Rome; was edu-

cated in England and in Rome; married Hugh Fraser, afterwards Minister to Japan; traveled with her husband in the two Americas and in the East; and was received into the Roman Catholic Church in 1884. Mrs. Fraser's finest literary work has been in interpreting the new Japan, the beauty of the land and the sense of beauty in its people. In 1899 she published an account of her observations in *A Diplomat's Wife in Japan* and five stories, called *The Customs of the Country, or Tales of New Japan*. With like sympathy and charm of style she has depicted Devonshire life in *A Chapter of Accidents* (1897), and modern Roman society in *The Splendid Porsenna* (1899).

FRASER, SIMON. See LOVAT, twelfth Lord.

FRASER, SIMON (c.1729-77). An English soldier. He was a subaltern officer in one of the two battalions of the Earl of Drumlanrig's regiment that had been in the Dutch service for some time previous to 1749, and in that year was pensioned upon the reduction of the two battalions to one. In 1757 he was appointed a captain-lieutenant in the Second Highland Battalion (later the Seventy-eighth Highlanders), and was soon after promoted to the rank of captain. He was present at the siege of Louisburg and at the action at Quebec. He afterwards served in Germany, at Gibraltar, and in Ireland, and rose to be lieutenant-colonel of the Twenty-fourth Foot. With the rank of brigadier for America, he accompanied Burgoyne in the pursuit of the American forces retreating from Fort Ticonderoga under the command of Saint Clair, and at Hubbardton (July 7, 1777) he won a complete victory over them. He participated also in the first battle of Saratoga (September 19), and in the second (October 7) was mortally wounded.

FRASER, THOMAS RICHARD (1841-). An English physician, born at Calcutta, and educated at the University of Edinburgh, where he graduated in medicine in 1862. He was assistant physician in the Royal Infirmary, Edinburgh (1869-74), a member of the Admiralty committee on Sir George Nares's Arctic expedition in 1876-77, and in 1877 became professor of materia medica at Edinburgh, and of clinical medicine in the year following. He was dean of the faculty of medicine from 1880 to 1900, and was president of the Indian Plague Commission. He became an authority on the action of poisons. His more important scientific writings include: *An Investigation Into Some Previously Undescribed Tetanic Symptoms Produced in Cold-blooded Animals* (1867-68); *An Experimental Research on the Antagonism Between the Action of Physostigma and Atropia* (1870); *The Character, Action, and Therapeutic Uses of Physostigma* (1883), a work which won him the Cameron Prize at the University of Edinburgh, and the Barbier Prize from the Academy of Sciences, Paris; and the *Dyspnoea of Bronchitis and Asthma* (1887).

FRASER, Sir WILLIAM (1816-98). A Scottish genealogist, born in Kincardineshire. He became deputy keeper of the records at Edinburgh in 1880. In this capacity he obtained access to the valuable material which enabled him to prepare his numerous genealogical works, which though somewhat dry in style are of high importance to the student of Scottish history. Fraser was distinguished for his numerous charities, and left more than £60,000 for educational and benevolent purposes. Among his rather vo-

luminous genealogies and histories may be mentioned: *History of the Carnegies, Earls of Southesk* (2 vols. 1867); *The Chiefs of Colquhoun and Their Country* (2 vols. 1869); *The Lennox* (2 vols. 1874); *The Douglass Book* (4 vols. 1885); and *The Elphinstone Family Book* (2 vols., 1897).

FRASER, Sir WILLIAM AUGUSTUS (1826-98). An English politician and author. He was born in 1826, the eldest son of Col. Sir James John Fraser, who fought at Waterloo, and was educated at Eton and at Christ Church, Oxford, graduating B.A. in 1849. Entering the army two years before receiving his degree, he rose to a captaincy in 1852, but resigned his commission and entered Parliament in the Conservative interest. He represented Barnstaple (1852 and 1857), Ludlow (1863), and Kidderminster (1874-80). In 1862 he was elected a fellow of the Society of Antiquaries, and subsequently was a member of the Queen's bodyguard for Scotland. Fraser became famous in London society for his stories and anecdotes concerning Wellington and Disraeli. He published: *Words on Wellington* (1889); *The Waterloo Ball* (1897); *Disraeli and His Day* (1891); *Hic et Ubique* (1893); and *Napoleon III.* (1896). He died in 1898. By his will he left a valuable collection of Gillray's caricatures to the House of Lords and a like collection of Doyle's caricatures to the House of Commons. His library was sold at auction for above £20,000.

FRA'SERA. A genus of North American plants of the order Gentianaceæ, named after John Fraser, an English botanist. The species are strong-growing, single-stemmed, usually biennial herbs, with thick bitter roots, opposite or whorled leaves, and bluish, white, or yellowish, generally spotted flowers in cymose clusters. They are rarely seen in cultivation.

FRA'SERBURGH. A seaport in Aberdeenshire, Scotland, on a branch of the Great Northern Railway, 42 miles north of Aberdeen (Map: Scotland, G 2). It is the chief seat of the Scotch herring fishery, and besides cured herrings and cod, exports oats, barley, meal, and potatoes. It has three tidal harbors, and its shipping includes 14 sailing vessels, 8 steam vessels, and a fleet of 700 fishing-boats. The town possesses a handsome cross, town hall, and spacious custom-house; the streets are wide and clean, with substantial dwellings. Its site is immediately south of Ptolemy's *Promontorium Texalium*, now Kinnaird Head, on which stands Fraser's ancient castle, utilized as a lighthouse, with its mysterious wine-tower and a cave beneath. Population, in 1891, 7466; in 1901, 9000, with a large increase during the fishing season in July and August.

FRASER RIVER. The principal stream of British Columbia, comprising in its basin of 138,000 square miles the greater part of the province (Map: British Columbia, E 4). The Fraser River proper has its origin in the union of two branches, the more important of which receives its waters from a series of lakes that lie in latitude 54° to 55° N., longitude about 124° 50' W., and flows in a general southeast direction for 260 miles, where it unites with the other branch, 200 miles long, which has its source near Mount Brown, in the Rocky Mountains. The point of confluence is near Fort George, and thence the Fraser River flows in a generally

southerly direction through nearly the whole length of the province, and, after a total course of 740 miles, empties into the Gulf of Georgia between Vancouver Island and the mainland, just north of the international boundary of 49° of latitude. Its chief affluents are the Stuart and the Chilcoten on the right, and the Thompson on the left. Between the Stuart and the Chilcoten, and on the same side, the Fraser River is joined by an affluent of historical interest—the West Road River—which took its name from its having been ascended by Sir Alexander MacKenzie on his adventurous journey of 1793 from the Hudson Bay territories to the Pacific Ocean. The Fraser River is navigable for small and powerful steamboats as far as Fort Hope, and at high water to Yale, 190 miles from its mouth, while to about half that distance—as far as New Westminster—it is navigable for large ships. Above Fort Hope the river sweeps through Big Cañon, which is traversed from Lytton downward by the Canadian Pacific Railway. From April to August the river is subject to floods, caused by the melting snow on the mountain ranges. In the narrow mountain valleys the river rises as much as 60 feet above its normal height, and in the lower valleys covers 150,000 to 200,000 acres of rich land. The Canadian Government has under consideration a comprehensive engineering plan of dams and dikes to mitigate this evil.

In 1857 the Fraser River, in its auriferous diggings and washings, began to stand forth as the rival of California and Australia. The discoveries, originally confined to the lower basins, have become more extensive and more productive, and eastward on the Thompson and northward among the upper waters of the great artery of the country the precious deposit has sometimes given almost fabulous returns. After 1862 washings and surface diggings were succeeded by systematic mining and steady labor. The Fraser River, its tributaries, and the numerous lakes communicating with them, furnish great facilities for the transport of timber. The lower Fraser country especially is densely wooded. The salmon of the Fraser River, of which there are five species, are justly famous, and the fishing and canning industries are of considerable importance. The river takes its name from Simon Fraser, who, in spite of the hostility of Indians and the natural difficulties to be overcome, explored it to its mouth in 1808.

FRASER RIVER SALMON. A species of salmon (*Oncorhynchus nerka*), called 'blueback,' 'redfish,' etc., which is the most common and valuable one in and near the Fraser River, B. C. See SALMON; REDFISH; PLATE OF SALMON.

FRA'SERVILLE, or RIVIÈRE DU LOUP, râ'vyar' du lœ (EN BAS). A town, summer resort and important railway centre of Temiscouata County, Quebec, Canada, picturesquely situated on elevated ground at the confluence of the Rivière du Loup with the Saint Lawrence, 125 miles north-east of Quebec (Map: Quebec, G 3). It is on the Intercolonial Railway, and is the terminus of the Temiscouata Railway. It has the Fraser Institute and other educational establishments, and carries on a considerable general trade. It is much frequented for its shooting, angling, boating, bathing, and its scenery. Population, principally French-Canadian, in 1891, 4175; in 1901, 4569.

FRASIER, frā'zhēr (OF., Fr., strawberry-plant, from *fraise*, strawberry, from Lat. *fragum*, strawberry-plant). In heraldry, a strawberry-flower appearing in the arms of the Scotch family of Fraser, as identical with a cinquefoil. See HERALDRY.

FRATERET'TO. One of the evil spirits by which Edgar pretends to be possessed during his mad scene in the third act of Shakespeare's *King Lear*. The name of this demon, as well as of some others in the same act, Shakespeare took from a book by Dr. Samuel Harsnet on *Popish Impostures*, published in 1603. In this Harsnet says: "Frateretto, Fleberdigibet, Hoberdinance, Tocobatto, were four devils of the round, or Morrice, whom Sara in her fits tuned together, in measure and sweet cadence. These four had forty assistants under them, as themselves do confess."

FRATERNAL INSURANCE. The characteristics which distinguish fraternal insurance from other forms are not to be sought in any peculiarity of the insurance itself, but rather in the nature of the body which grants it. There is no single feature of fraternal insurance which is not to be found in other systems of life insurance. Fraternal insurance is insurance granted by a 'fraternal beneficiary' society or order to its members. The essentials of such a society, as laid down by the National Fraternal Congress, are, that it should be organized in a system of lodges, that it should have a ritual and a representative form of government, that it should pay benefits, and should not conduct its business for profit. Such societies have almost invariably collected their premiums by means of assessments; but the assessment principle is not essential to their business, and on the other hand its use is by no means confined to such organizations. A great deal of undeserved odium has attached to fraternal insurance societies owing to the failure to discriminate between them and commercial assessment companies. The history of the latter is for the most part a record of inefficiency or dishonesty on the part of the managers and credulity on the part of the members, ending in a large proportion of cases in financial disaster.

HISTORY. The early American fraternal societies were established somewhat on the lines of the English friendly societies, several of which founded branches in the United States during the first half of the nineteenth century. Both the English and the early American societies paid benefits of various kinds, often including funeral benefits and payments to the survivors of the deceased members, but none of them established a system of payments deserving the name of life insurance. The first person in the United States to recognize the possibilities of developing on a large scale coöperative relief in the form of death benefits or life insurance through a system of affiliated lodges was John Gordon Upchurch, who founded in 1868 the Ancient Order of United Workmen. This society is still in existence and contained in 1902 420,000 members. Several other benefit societies, organized on the lodge system, were established during the next decade. Some of these introduced the insurance feature at once, led to it by the high rates charged by the old-line companies and the harsh provisions of their policies. A more powerful impetus toward the introduction of insurance into such societies came in the seventies,

when more than sixty legal-reserve old-line companies failed, creating a feeling of distrust and hostility toward them. Under the influence of this feeling fraternal societies already established introduced the insurance feature, new societies providing for it were formed, and non-fraternal assessment insurance companies appeared in large numbers. In the decade 1881-90, many additional fraternal insurance companies were organized. The eleventh census reported that on December 31, 1889, there were in the United States 298 such orders with 40,342 subordinate lodges. Owing to unsound financial methods, the term of life of many of these orders was very short, so that, in spite of the founding of many new orders, since 1890 there has probably been no increase in the total number in existence.

It is impossible to compile a complete list of existing fraternal insurance societies, or to collect full statistics about them, since in many States they are exempted from the duty of making reports to the Insurance Department. Many of the largest companies, however, are federated in the National Fraternal Congress, and for these companies it is possible to obtain complete statistics. In December, 1900, the congress included 47 orders, with 2,855,774 benefit members. The net gain in members for the year had been 327,513. The protection in force at the end of the year was \$4,585,579,982, and the net gain for the year \$401,952,932. It is probable that other orders not affiliated with the congress had approximately 1,000,000 members, with at least \$1,000,000,000 insurance in force. It is interesting to note that on the same date, December 31, 1900, the old-line life insurance companies reporting to the New York Insurance Department—companies which carried at least 95 per cent. of the life insurance in force in old-line companies in the United States—had policies in force amounting to \$4,076,283,539.

ORGANIZATION AND ACTIVITIES. The forms of organization of the fraternal orders are various. Their government is representative, and is vested in a supreme body consisting of an executive head and certain official associates. In some orders State lines are observed and State officers exercise immediate jurisdiction in many matters over the local lodges in the State. While nominally subordinate to the general body, they are more or less masters of the order in their own territory. Some orders have no intermediate State organization; the local associations are directly affiliated with the supreme body. The Ancient Order of United Workmen may be cited as an illustration of the former class, the Independent Order Sons of Benjamin of the latter. The activities of the different orders are also very various. It is unnecessary to speak of the social features which constitute so important a part of their life. These are entirely under the control of the local bodies, and manifest little approach to uniformity. In the matter of benefits also there is very great diversity. Some of the societies give only death benefits; others give benefits of many other kinds, such as disability, accident, sickness, burial, and monument benefits. These miscellaneous benefits are usually supported and managed by the local lodges. The death benefits, on the other hand, are usually under the control of the supreme national body; in a few orders they are maintained by the general State organization. Three federations of fra-

ternal beneficiary associations have been formed: the National Fraternal Congress, the American Fraternal Congress, and the Associated Fraternities of America. The National Fraternal Congress was formed at a meeting held in Washington in 1886, at which delegates from 17 orders were present. The orders represented at the congress of 1901 numbered 47. In the constitution the objects of the congress are "declared to be the uniting permanently of all legitimate fraternal benefit societies for the purposes of mutual information, benefit, and protection." In recent years it has devoted a large part of its time and energy to the attempt to accomplish two objects. The first is the voluntary increase of assessment rates by the affiliated orders for the purpose of accumulating reserves, or, as they prefer to call them, emergency funds; the second is the securing of uniform legislation by the various States on matters affecting fraternal insurance. Some of the specific measures advocated by them will be referred to later on.

The American Fraternal Congress was organized at Omaha, Neb., in 1898, by representatives of 18 fraternal orders. The purpose of this organization was to work for the establishment of reserve funds by the fraternal societies. No society without a reserve fund was eligible to membership. The National Fraternal Congress has done so much work along the same line that the more recent federation has little occasion to act and has not become very prominent. The Associated Fraternities of America was organized at Chicago in 1901 by representatives of the younger fraternal orders in opposition to the National Fraternal Congress. Forty-two societies were represented at the meeting. The first annual meeting was held in July, 1901, 24 associations being represented. The point of conflict between the two organizations will become apparent on considering the nature of the legislation sought by the National Fraternal Congress. It is in brief the enactment of a minimum assessment rate for all fraternal insurance organizations. The purpose is to prevent the appearance of new companies with low assessment rates to draw away the 'new blood' from the old established companies, in which the advancing death-rate has made necessary an increase in assessments in order to pay losses. Such legislation the younger orders naturally resist.

TECHNIQUE. Assessment insurance was organized largely in protest against the methods of the old-line life insurance companies. It was generally believed that the cost of insurance in those companies was unnecessarily high. A reduction in cost was anticipated from two sources. In the first place, it was proposed to reduce the expense of management to a minimum, and in this way to cut down the heavy 'loading' which the old-line companies added to the natural premium. In the second place, it was proposed to do away with the enormous surpluses which the old-line companies were held to be continually accumulating and never paying out. "Pay your losses as they occur and keep your reserve in your own pockets," was the maxim of the advocates of the assessment principle. No financial craze recorded in history has affected more people, or people with sounder judgment in ordinary business matters, than did the assessment craze. Its culmination was reached in the establishment of a large number of assessment endow-

ment societies, which guaranteed to every member a certain stipulated sum at the end of a fixed period of time in return for a number of periodical payments to the company. The Iron Hall was the first and most notorious of these associations. This organization virtually promised its members that in consideration of the annual payment to the society for seven years of 18 assessments of \$2.50 each, making a total contribution of \$315, each member should receive from the society \$1000 at the end of the seven years. For a few years such payments were actually made, the endowment of the early members coming out of the contributions of the new members. Only by a steady increase of membership at a continually increasing geometrical ratio could such a system be maintained. The Iron Hall and all its imitators came to grief within a few years, bringing loss upon millions of people in the United States.

The assessment life-insurance companies were managed on no sounder principles than the assessment endowment societies. At the beginning all of them, whether fraternal or non-fraternal, raised their funds by assessments after the death for which indemnity was to be paid. In the early days of an assessment company, while the average age of the members was low and the benefit of medical selection was still felt, these assessments were very small. Knowledge of the scientific principles of life insurance was not to be found among the promoters of these companies. The need of mortality tables and the desirability of accumulating a surplus during the earlier years to prepare for increasing mortality were both denied. It was the general claim that the continual accession of new members would prevent any advance in the average age of the members or in the death-rate. This might have been the case if a company had been started with a membership whose age distribution was properly related to a sound mortality table. It could not possibly be the case in a company which started, as all these companies did start, with a great preponderance of young members. In such a company it is clear on *a priori* grounds that the average age of members must increase. Experience soon demonstrated the same fact. The average age of members and the death-rate increased, and the inevitable increase in the rate of assessment kept new members out of the society, and on the other hand the lapse rate continually advanced, through the withdrawal of members who were unwilling to pay the increased assessments, or desired to join new societies in which the average age, death-rate, and assessments were still low. The vast majority of non-fraternal assessment societies and a large number of fraternal associations were in this way forced out of business.

The greatest enemies of an old established fraternal insurance society are unreasonable expectation created by unjustifiably low rates at the beginning, and new companies with low mortality and small assessments. Realizing this fact, the old societies which are federated in the National Fraternal Congress have adopted two lines of action to protect themselves. In the first place, they have undertaken a campaign of education among their own members. Year after year they analyze the returns of the constituent orders, and point out the inevitable advance from year to year in average age, in death-rate, and in cost

of insurance, as well as the tendency of the members to desert the old companies and flock to the new. A comparison of the average annual death-rate in different years for the entire congress has no significance, since old companies with a high death-rate are continually passing away and new companies with low death-rates coming in. At the meeting of the congress in 1899 the report of the committee on statistics pointed out that while the average death-rate for the whole body was 8.65 per 1000 in 1898, as compared with 9.32 in 1897, if allowance was made for the influence of the new orders in lowering the rate (it was impossible to make allowance for the similar effect of the withdrawal of the older orders), the figures would be 8.87 in 1897 and 8.89 in 1898. The committee also compiled the death-rates for 21 companies for each of ten years. In 1888 the average had been 7.22, in 1893 9.34, and in 1898 10.84. As to the effect of these changes upon membership it was shown that of the 46 orders reporting that year 19 had a death-rate above the average for the group, and 27 a rate below the average; that the 19, with a membership at the beginning of the year of 869,862, had made a net gain during the year of only 2415; and that the 27, with a membership at the beginning of the year of 1,192,811, showed a net gain of 217,282. The rate of gain in the former group was 0.28 per cent., and in the latter 18.26 per cent.

In a similar way the committee demonstrated that average age and cost of insurance both increase as the society grows older. Thoroughly aroused by such revelations, the congress authorized the appointment of a committee to prepare tables of rates by applying to a proper extent the principles of a reserve or an emergency fund. This committee first prepared a new mortality table, after investigation which convinced it that the tables of mortality in use by the old-line companies were higher than experience justified. The divergence between the old tables and the new ones is brought out by the following comparison of the death-rate per 1000 living at different ages:

AGE	American experience table	Fraternal table	AGE	American experience table	Fraternal table
20	7.81	5.00	60	26.69	22.75
25	8.07	5.20	65	40.13	34.40
30	8.43	5.55	70	61.99	53.65
35	8.95	6.15	75	94.37	85.48
40	9.79	7.17	80	144.47	138.10
45	11.16	8.88	85	235.55	225.10
50	13.78	11.45	90	454.55	368.95
55	18.57	15.71	95	1000.00	606.78

While the mortality experience of every old-line life-insurance company which exercises due care in the selection of its risks shows a rate of loss below that indicated by the American Experience Table, the degree of difference between the two tables here outlined gives reason to think that the Fraternal Table is very close to the margin of safety. At the same time it is a great advance over no table at all, and experience will soon test its validity.

On the basis of the new mortality table, and on the assumption that the reserve will earn four per cent. interest, the committee prepared several tables of minimum rates. Besides the level annual rate, such as is commonly used by old-line companies for whole-life policies, the com-

mittee prepared a table of rates peculiar to the fraternal and assessment societies, the so-called step rate. The step rate advances with advancing age, but not from year to year as the natural premium rate does, but at stated intervals, usually every five years. By a modification of the step-rate plan a slight addition is made to the premium rate during the earlier years, in order to make possible a reduction of the rate in old age. All the rates prepared by the committee presuppose the abandonment of the system of assessing after the occurrence of the loss and the accumulation of a surplus at least for one year. The congress has urged its members to adopt as minimum rates those prepared by the committee, with such loaning for expenses as each association finds necessary. Some organizations have done this, but the extent to which changes have been introduced is very unequal. The result is a high degree of diversity of rates. At the National Congress for 1899 there was exhibited a table of rates actually charged for the same kind of insurance at the same age in different fraternal societies. At age fifty, for example, no less than 41 rates for the same protection were in force in different companies, varying by moderate differences from a minimum of 65 cents to a maximum of \$3.80.

Despairing of its ability to secure the adoption of the new rates through the voluntary action of the orders, and dreading the effect of the competition of new orders with low rates, the congress has begun the attempt to secure the adoption of these rates through legislation. In the session held in 1901, the president reported that legislation requiring the establishment of these minimum rates as conditions of doing business in the State had been secured in five States, viz. North Dakota, Tennessee, Washington, Vermont, and Indiana. Similar legislation will doubtless be secured soon in other States. Whether the low rates thus established will be found high enough to maintain the companies permanently in a sound financial position it is impossible to say.

Rates in the fraternal companies can be legitimately kept below rates in the regular companies in only two ways: either by making such a selection of lives that the rate of mortality is lower in the former than in the latter, or by keeping expenses of management below those of the old-line companies. To a greater or less extent both these aims are accomplished. There can be no doubt that the close personal scrutiny which every individual undergoes before being admitted to a lodge is a valuable supplement to the medical examination. If it is found that the mortality schedule adopted is sufficiently high, rates may legitimately be put below the old-line level. Moreover, the expense of management in the fraternal is reduced to a minimum. Not to speak of the large amount of gratuitous service rendered by the members of many associations, the entire absence of agents for soliciting business is a source of great economy to the companies. The amount paid agents by the old-line companies is approximately one-third of the amount paid to policy-holders. It is clear, therefore, that there are great opportunities for economy by the fraternal companies, and it may fairly be expected that those among them which take to heart the lessons of experience and put their business on a sound basis so far as the matter of surplus is concerned, will continue their

usefulness indefinitely, furnishing insurance in comparatively small amounts at low rates to those most in need of it and least able to pay for it at high rates.

FRATERNITIES (Lat. *fraternitas*, brotherhood, from *fraternus*, brotherly, from *frater*, brother; connected with Gk. *φράτηρ*, *phratēr*, clansman, OChurch Slav. *bratrŭ*, OPruss. *bratis*, Lith. *brŭlis*, Ir., Gael. *brathair*, Corn. *bredar*, Skt. *bhrātar*, Goth. *brōþar*, OHG. *bruodar*, Ger. *Bruder*, AS. *brōþor*, Eng. *brother*), **AMERICAN COLLEGE**. Societies of students found in nearly all the colleges and universities of the United States. In general they are secret in character; but this secrecy is largely nominal, consisting chiefly of extreme care in protecting their constitutions and mottoes from outside knowledge, and in holding secret meetings. Aside from this they do not cultivate mystery in their methods or work. The fraternities are composed of branches called 'chapters,' situated in the various colleges. But no fraternity has more than one chapter in any one college. Usually the students of all collegiate departments are eligible to membership, though the academic department has uniformly furnished the largest part of fraternity membership. Fraternities are variously termed by outsiders, 'Greek-Letter Fraternities,' and 'College Secret Societies,' but among themselves the term 'Fraternities' is universally used.

NOMENCLATURE. The Greek alphabet is generally employed to name both the fraternity and the chapter. Usually a Greek letter is assigned to a chapter according to the order of its establishment; but in some fraternities the name of the State may be added, and infrequently the chapter takes its name from the college or town in which it is placed. An extremely rare instance is known of one chapter, which is named after a prominent individual. When chapters have used all the letters of the alphabet, it is customary to start anew, and add the word 'deuteron' to the letter, thus signifying second. The badges of the fraternities are of three types. One is a plate of gold, which displays the fraternity name and one or more symbols of special significance. A second form is a monogram of the letters of the fraternity, while the third is a symbol, as a key, a skull, or a scroll.

ORIGIN, ETC. The first Greek-letter society, Phi Beta Kappa, was organized at the College of William and Mary in 1776. "The promotion of literature and of friendly intercourse among scholars" was its given *raison d'être*. Its origin is legendary. Three stories of its birth have been handed down by tradition. One gives Thomas Jefferson the honor of founder, one asserts that it sprang from a lodge of Free Masons, the third claims that it was brought from Europe. The first meeting was held in the Apollo room of the old Raleigh Tavern at Williamsburg, Va., a spot made famous by the historic speech of Patrick Henry. In December, 1779, branches were authorized at Yale and Harvard, and in 1780 the meetings of the parent chapter ended amid the vicissitudes of the Revolution, then raging in the immediate vicinity of Williamsburg. The Yale chapter was established in 1780, and that at Harvard in 1781. In 1787 these two chapters united to found a chapter at Dartmouth College. In 1831 the Harvard chapter gave up its individual secrets, and in that year its motto, 'Philosophy, the Guide of

Life,' became public. Since 1831 a purely honorary status has existed, and membership is gained only by high scholarship, and given only to honor men usually of graduating classes. (See PHI BETA KAPPA.) In Yale in 1821 a literary society was founded, called the Chi Delta Theta. Many other literary societies existed at about the same time, in which might be mastered the art of debate, and in which oratory might be indulged in before an audience of college mates. These literary societies served no mean part in college life, and they had faculty approbation and encouragement; but their literary contests and election rivalries destroyed any deep fraternal interest in them. The fraternity system, as it exists to-day, originated at Union College in 1825, when the Kappa Alpha, the first of men's general fraternities, was established. Externally it imitated the Phi Beta Kappa in its secrecy, in its Greek title, and in its limitation of membership to upper-class men. The start of the fraternity system was very simple. But its novelty was so marked that it at once aroused opposition on the part of the faculty. That attitude has now, however, almost entirely changed. Antagonistic legislation has been greatly modified or else abandoned. Faculty and students dwell in amity, and through the medium of the chapter houses entertain and meet socially their instructors. Ex-President White, of Cornell, President Andrews, of Nebraska University, and other leading educators both East and West, have given public expression to their belief in the utility and value of the college fraternity system. In 1827 we find the Sigma Phi and the Delta Phi established at Union. The system was now well launched, but at one institution alone. In 1831 the Sigma Phi placed the first chapter of any fraternity (omitting Φ B K, now become an honor society) at Hamilton College; and this move probably led to the foundation of Alpha Delta Phi at Hamilton as a competitor in 1832. Alpha Delta Phi started a chapter at Miami University in 1835. Prior to this expansion the fraternity system was confined to two States, New York and Massachusetts, and to the three colleges, Union, Hamilton, and Williams. At Miami in 1839 another fraternity, the Beta Theta Pi, was founded. Before 1839 Union College saw one more fraternity established, the Psi Upsilon, in 1833. At Williams was founded the Delta Upsilon in 1834. The year 1840, thirteen years after the foundation of Kappa Alpha, marks the time when the system could be clearly termed national. Since that period the system has spread, the establishment of fraternities and chapters becoming more frequent until, in 1898, the last year in which a statistical canvass was made, there were approximately 800 chapters in existence. One society, the Delta Upsilon, was in its foundation at least entirely anti-secret. The advent of the fraternity system hurt the prestige of the literary societies through competition for membership and in other ways, and on that account four literary societies met in convention in 1847, and formed the 'Anti-Secret Confederation.' In 1858 a fraternity was effected out of this confederation, changing its status and adopting the monogram badge of Delta Upsilon. In time Delta Upsilon became only nominally non-secret, to-day ranking practically with other secret fraternities. It is believed that no other non-secret fraternity could be successfully started.

WOMEN'S FRATERNITIES. The women's fraternities followed naturally upon the general opening of colleges to co-education, and as young women came to participate more and more in college life, to live in dormitories, and take up college residence. The first of these sororities (as these fraternities are called) was the Kappa Alpha Theta, founded at De Pauw University in 1870. The second, Kappa Kappa Gamma, was founded at Monmouth College in the same year. The Delta Gamma started at the University of Mississippi in 1872, and the Alpha Phi was also installed in 1872 at Syracuse University. The Gamma Phi Beta was launched at Syracuse University in 1874. The Delta Delta Delta was organized at Boston University in 1888, and the Pi Beta Phi (originally I C Sorosis) was founded at Monmouth College in 1867. These societies are practically identical in aims and purposes with the men's fraternities, and in colleges where houses are owned by sororities their general similarity as part of the college organization is marked. It is but thirty-two years since the first sorority was founded. To-day the alumni interest is very strong, and has taken material expression in homes for the sororities at various colleges and universities.

LOCAL FRATERNITIES. Local fraternities are many and important. Those at Yale University have become the most widely known. They are senior societies, and are three in number: Skull and Bones (1832), Scroll and Key (1841), Wolf's Head (1884). They always elect fifteen men in each year, have no electioneering or pledging, but offer their elections on the campus on a certain date of each year in an impressive manner in the presence of the student body. The system is peculiar, and exists at no other college.

ORGANIZATION, ETC. Prior to 1861, the government of a fraternity was usually retained as a heritage by one chapter, but was modified at times by the several chapters assembled in convention. The year 1870 is generally accepted as the date of a solidified system. After the Civil War the fraternities which had suffered through the enlistment of their members—and in some cases a whole chapter would be enlisted—recovered activity, and widened their organizations. Then a better government was effected, the governing powers becoming well centralized and stable. In general, the legislative power of fraternities has been vested in an annual convention of delegates, while the administration has been placed upon a few officers there elected.

Social life forms the basic *raison d'être* of all fraternities. They seek as members those who promise to contribute most to a fellowship where social equality, good scholarship, athletic abilities, and mutual helpfulness are sure to be maintained.

Naturally the contest for members is intense. In general this campaign is the great student feature of the beginning of each college year. Entrance to the fraternity is gained by an initiation, which is widely announced among the members, and usually attracts a large alumni attendance. The chapter house is the most notable part of fraternity life. Statistics show that there were in 1883 but 33 houses owned and occupied by the general fraternities. In 1890 there were 70 such houses. But in 1898 425 houses were owned or occupied by the national, local, and women's fraternities of the United

COLLEGE FRATERNITIES



ZETA PSI



KAPPA KAPPA GAMMA



SIGMA PHI



ALPHA DELTA PHI



KAPPA ALPHA
SOUTHERN



PHI GAMMA DELTA



CHI PSI



DELTA KAPPA EPSILON



PHI DELTA THETA



KAPPA ALPHA THETA



SIGMA CHI



PHI BETA KAPPA



KAPPA SIGMA



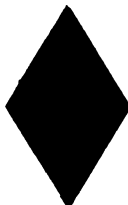
BETA THETA PI



SIGMA ALPHA EPSILON



DELTA TAU DELTA



PSI UPSILON



DELTA UPSILON



ALPHA TAU OMEGA



PHI KAPPA PSI

States. Of these 134 were owned by the men's fraternities, and 3 owned by the sororities. This great increase is instructive, illustrating the growth of fraternities in a single decade.

The control of the chapter house is vested in a corporation of alumni, but generally subject to the immediate management of the students.

Fraternity members are styled 'active' when in actual college attendance; 'alumni' afterwards. Should they be elected while not undergraduates, they are termed honorary members. To bestow honorary membership is, however, at the present time generally discountenanced. For a member to belong to two fraternities at any one college, or to two at different times in different colleges, is reprehensible and forbidden. Most fraternities publish catalogues, song-books, and magazines. Each fraternity deems a catalogue a necessity. In early days these were mere lists of membership, but now they generally contain addresses of members, the rolls of chapters, and tables of varied statistics, including an important table showing the geographical distribution of chapters and members. Histories have been issued by a few of the fraternities. The song-books have special music in addition to usual college songs, with words written by members. The periodicals are an important factor in the fraternity life. Periodicals are now published by Alpha Tau Omega, Alpha Chi Rho, Beta Theta Pi, Chi Psi, Delta Kappa Epsilon, Delta Tau Delta, Delta Upsilon, Kappa Alpha, Kappa Sigma, Phi Delta Theta, Phi Gamma Delta, Phi Kappa Psi, Phi Kappa Sigma, Sigma Alpha Epsilon, Sigma Chi, Sigma Nu, Theta Delta Chi. The following women's fraternities publish periodicals: Alpha Chi Omega, Alpha Phi, Chi Omega, Delta Delta Delta, Delta Gamma, Kappa Alpha Theta, Kappa Kappa Gamma, Pi Beta Phi.

The legal status of fraternities has in several cases been in litigation. In one case, hinging upon the right of a college faculty to debar a student because of his fraternity membership, the Supreme Court of Indiana (1881) decided: "There is no doubt whatever that if an applicant for admission into a public college is otherwise qualified, and there is room to receive him, he cannot be denied admission by reason of membership in a college fraternity." And the Court held further that the requiring by the faculty of a written pledge from the student that he would not join a fraternity, as a condition precedent to his matriculation, implied discrimination against a class of inhabitants of the State. On the other hand, it appears to be established that a privately endowed and managed college may exact and enforce such a pledge. In May, 1901, the Arkansas Legislature enacted a law "to prohibit the organization of (and membership in) secret societies in the University of Arkansas, and for other purposes." The legality of this law is to be tested in the courts. One of the most important cases that has been recently decided, at least from a theoretical point of view, and involving the internal organization and powers of a fraternity, was that of the Kappa Kappa Gamma Society versus certain members of its Grand Council. The Grand Council had endeavored to withdraw, without its consent, its Beta Beta chapter, and suits to restrain the Council, through the individual members thereof, were instituted in New York and Massachusetts. The Massachusetts court dismissed the suit on the ground that no property

right was involved; but the New York courts held, on appeal, among other things, that the publication of *fraternity suits* by the Beta Beta chapter had been proper, inasmuch as the fraternity had virtually compelled it; that rights were affected for which a court of equity could give remedy, and that the fraternity should, on the facts presented, be restrained from withdrawing its chapter. Consult: Baird, *American College Fraternities* (New York, 1898); Kellogg, *College Secret Societies* (Chicago, 1874); Aiken, *The Secret Society System* (New Haven, 1882); Emerson, *The College Year-Book and Athletic Record* (New York, 1897); Maxwell, *Greek Letter Men of New York* (New York, 1899); Randolph, "Greek Letter Societies in American Colleges," in *New England Magazine*, vol. xvii.; "White Fraternities," in *Forum*, vol. iii. For college societies which are not, strictly speaking, fraternities, see SOCIETIES; COLLEGES, AMERICAN.

FRATICELLIANS, or **FRATICELLI**, frä-tichél'lē (It., ML. *fraticelli*, little brethren, diminutive of Lat. *frater*, brother). A name applied to various more or less strictly defined heretical sects of the Middle Ages, not closely connected either by their beliefs and tendencies or by their time. Their general tendency was one of protest against the existing ecclesiastical and social order, and there is little to distinguish them, to the modern mind, from the Albigenses, Waldenses, Catharini, Beghards, and Brethren of the Free Spirit. The name is found as early as the beginning of the fourteenth century, for example in the chronicle of Giovanni Villani. The origin of the Fraticelli proper has often been connected with the Franciscan Order, or with a particularly strict and rigorist party within it. This theory is supported by the fact that this name was common in Italy to designate the Friars Minor; but it seems much more likely that, as the immense popularity of the Franciscan Order produced a multitude of unauthorized imitations of it, these innovations in doctrine found ready acceptance in such groups, unrestrained as they were by any close oversight of ecclesiastical authority. As a sect, their origin may, with the greatest probability, be traced to Gherardo Segarelli, a laboring man of Parma, and his disciple, Dolcino of Novara, who organized their followers as an 'apostolic Order,' and made considerable noise in Upper Italy from 1260 to 1307. They declared poverty an absolutely essential condition of belonging to the true Church, and regarded the existing Church as in a state of apostasy. They had no fixed domiciles, but wandered from place to place. They were not bound by any definite rule, and under Dolcino at least, their career was marked by the 'free-love' excesses which have formed part of the history of later Anabaptist and communistic associations. The adherents of Segarelli and Dolcino held that all authority was forfeited by sin, and proceeded to fill all the offices which, on their hypothesis, were vacant, electing a certain Majoretto Emperor, a secular priest named Rainaldo Pope, and choosing archbishops of Florence and Venice and a general of the Franciscans who did not even belong to the Order. They were gradually suppressed in the course of the first half of the fifteenth century; John Capistrano was commissioned as inquisitor-general in their regard by Martin V., Eugenius

IV., and Nicholas V., and succeeded in completing their eradication. Their last pseudo-pope was burned at Fabriano in 1449, and the sect disappears from history with him. For the sake of clearness, it would be well to restrict the name Fraticelli to the sect above described; but it is sometimes given to the rigorist Franciscans, and to the followers of Michael of Cesena. Consult: Döllinger, *Beiträge zur Sekten-geschichte des Mittelalters* (Munich, 1890); Lea, *History of the Inquisition* (London, 1894); and see FRANCISCANS.

FRATTAMAGGIORE, frät'tá-má-jó'rá. A city in South Italy, 8 miles north of Naples, with silk and rope factories and numerous country houses of rich Neapolitans (Map: Italy, D 10). Population, commune, in 1881, 11,000; in 1901, 13,170.

FRAUD. In its broadest sense, any variety of falsehood and artifice by which one deceives another to his legal injury. Courts have been cautious about defining this term, fearing that any precise and complete definition would tend to help crafty and dishonest persons in their attempts to evade the law, and would embarrass the courts themselves, when called upon to deal with new forms of fraud. In the courts of common law the term has borne a narrower and more exact signification than in courts of equity. We will deal with these significations separately.

At law, fraud is a false representation of some matter of fact, intended to deceive another and actually deceiving him to his legal injury. All of these elements must concur. There must be a false representation of fact as distinguished from an expression of opinion. A person who induces another to buy a horse for three hundred dollars, by falsely asserting that it is worth that sum when he knows it is worth but a hundred dollars, acts dishonorably, but does not render himself liable to an action for fraud. He has expressed an opinion, not asserted a matter of fact. Had he declared that the horse could trot a mile in three minutes, or was of a certain strain of blood, or was sound, he would have asserted a fact, which the other party would have had a legal right to rely on. It is to be borne in mind that a false representation may be made by conduct as well as by words; as when a manufacturer skillfully conceals a defect in an article. Simple non-disclosure of the truth, however, does not amount to fraud, for fraud involves the idea of active misconduct. If, however, a party makes a statement which is true as far as it goes, but because of his non-disclosure of other facts the statement conveys a misleading impression and deceives the other party, we have a case of fraudulent concealment.

Not only must the representation be one of fact, but the one making it must know it to be false; or he must make it in reckless disregard of its truth. In other words, there must be a dishonest intention to deceive. Mere negligence in asserting as a fact that which turns out to be false is not fraud, although it may subject the negligent actor to some other liability. Such, at least, is the doctrine which now prevails in England and in most of our States. The third element in an actionable fraud is the deception of the injured party. A manufacturer may patch up a defective article, intending to deceive a purchaser by such concealment of the defect. Still

if a person buys the article without question or examination, his purchase cannot be said to have been induced by the fraudulent conduct of the manufacturer. He was not deceived. He was simply careless.

While the one who complains of a false representation must show that he was actually deceived by it, he need not show that it was the sole or predominant motive to action. It is enough that it materially affected his decision; that it induced him to act as he would not have acted had it not been made. Finally, the deception must result in legal injury to a person, or he cannot insist that he has been defrauded. The law does not give redress for a naked lie. It leaves the punishment of that to another forum.

The legal effect of a fraud is to render every contract or transaction in which it is a material element voidable at the option of the defrauded party. One who has been defrauded into buying and paying for property has the right to rescind the contract, tender back the property, and recover the price. If one has been induced by fraud to sell property on credit, he may retake the property. Rescission is not the only right of the defrauded party, however. He may maintain an action for damages against the wrongdoer.

In EQUITY. Courts of equity have been accustomed to characterize such fraud as we have been considering as actual fraud, while they designate active misconduct as 'constructive fraud,' or 'conduct amounting to fraud in the contemplation of a court of equity,' or 'fraudulent in the eyes of this court.' Most of the acts falling within these categories, however, are distinguishable from fraud, in its proper sense; and courts of equity relieve against them, not because they have actually deceived their victim, but because they are repugnant to sound public policy, or because they fall under the head of *undue influence* (q.v.). In the language of Hardwicke, "Fraud does not here mean deceit or circumvention; it means an unconscientious use of the power arising out of certain circumstances and conditions; and when the relative position of the parties is such as *prima facie* to raise the presumption of undue influence by one over the other," the transaction cannot stand, unless the person claiming the benefit of it is able to repel the presumption by contrary evidence, proving it to have been, in point of fact, fair, just, and reasonable." Consult the authorities referred to under CONTRACT; TORT; and also Bigelow, *The Law of Fraud on its Evil Side* (Boston, 1888); Kerr, *Treatise on the Law of Fraud and Mistake* (4th ed., London, 1902).

FRAUDS, STATUTE OF. A statute originally passed in the year 1676 (ch. 3 of 29 Charles II.), and taking its name from its purpose, as expressed in the preamble—"the prevention of many fraudulent practices which are commonly endeavored to be upheld by perjury and subornation of perjury." This purpose the framers of the law thought could be accomplished by requiring written evidence, or certain formal acts of the parties, as proof of the more important business transactions. The statutes contain twenty-five sections, the most important of which may be classified as follows: The first three specify the manner in which interests in land may be created or assigned. The fourth describes the evidence requisite to establish certain agreements. The fifth and sixth, as well as sections

nineteen to twenty-two inclusive, regulate the execution and proof of wills. Sections seven to ten inclusive relate to trusts in lands. The seventeenth section applies to sales of personal property.

Opinions concerning the policy and the consequences of this statute have differed widely. It has received unstinted praise from judges and writers of great reputation, while it has been unmercifully criticised by others equally eminent. Chancellor Kent approved the view that every line of it was worth a subsidy, and declared that it would be hazardous to attempt to recast the statute in new language, or to disturb the order and style of its composition. On the other hand, Chief Justice Erle of England asserted that although the statute had been very much praised, he believed "that the party who inserted the words had no idea what he meant by 'acceptance'"; "that opinion," he added, "I found on the everlasting discussion which has gone on." Mr. Justice Stephen repeatedly characterized the seventeenth section as a nuisance, declaring that it "sins against several of what ought to be the well-recognized rules of national legislation." Notwithstanding the severe criticisms to which the statute has been subjected, most of its provisions have been reenacted by our State legislatures. Some of these have undoubtedly proved very beneficial, especially those relating to wills and to conveyances of interests in land. This is admitted even by Mr. Justice Stephen. The sections which have proved most fruitful of expensive and dishonorable litigation are the fourth and seventeenth, which are as follows: "That no action shall be brought (1) whereby to charge any executor or administrator upon any special promise to answer damages out of his own estate; (2) or whereby to charge the defendant upon any special promise to answer for the debt, default, or miscarriage of another person; (3) or to charge any person upon any agreement made upon consideration of marriage; (4) or upon any contract or sale of lands, tenements, or hereditaments or any interest in or concerning them; (5) or upon any agreement that is not to be performed within the space of one year from the making thereof, unless the agreement upon which such action shall be brought, or some memorandum or note thereof, shall be in writing and signed by the party to be charged therewith, or some other person thereunto by him lawfully authorized." "That no contract for the sale of any goods, wares, and merchandises, for the price of ten pounds sterling or upward, shall be allowed to be good, except the buyer shall accept part of the goods so sold, and actually receive the same, or give something in earnest to bind the bargain, or in part payment, or that some note or memorandum in writing of the said bargain be made and signed by the parties to be charged by such contract, or their agents thereunto lawfully authorized." The latter of these sections has been discarded in sixteen of our States, viz. Alabama, Arizona, Delaware, Illinois, Kansas, Kentucky, Louisiana, New Mexico, North Carolina, Ohio, Pennsylvania, Rhode Island, Tennessee, Texas, Virginia, and West Virginia. In the others it has been reenacted, although with various modifications of language.

It is to be noted that the English statute does not declare contracts void which are not entered into, or evidenced, as required by its provisions.

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"No action shall be brought," or "No contract shall be allowed to be good," is the language of the act. In some of them has been substituted for these expressions such language as this: "Every contract . . . shall be void," or "the agreement is invalid," unless the statutory requirements are complied with. Even in such States, however, the courts have generally construed the statute as it has been construed in England, not to render compliance with its provisions essential to the validity of the enumerated contracts, but only necessary to the proof of such contracts against the party who sets up the statute as a defense. For the application of this statute to particular topics, see the articles CONTRACT; EXECUTION; GUARANTY; INDEMNITY; LEASE; MARRIAGE; PRINCIPAL AND SURETY; SALE; SPECIFIC PERFORMANCE; TRUST; WILL. Consult: 1 *Law Quarterly Review*, p. 1; 5 *Encyclopædia of the Laws of England*; Browne, *Treatise on the Construction of the Statute of Frauds* (5th ed., Boston, 1895).

FRAUDULENT CONVEYANCE. A transfer of property in fraud of creditors or purchasers. It is undoubtedly voidable at common law by the party defrauded, but for more than three centuries it has also been under the ban of statutes known as 13 Eliz., c. 5 (1571), and 27 Eliz., c. 4 (1585). Although these enactments are generally accounted a part of 'the common law which accompanied the emigration of our ancestors' to this country, their provisions have been reenacted in most of our States. The first of these English statutes, after reciting "that feoffments, gifts, grants, alienations, conveyances, bonds, suits, judgments, and executions have been contrived of malice, fraud, covin, collusion, or guile, to delay, hinder or defraud creditors or others of their just and lawful actions, suits, debts, accounts, damages, forfeitures, etc.," proceeds to declare that every such transfer or incumbrance of real or personal property shall be utterly void "as against that person, his heirs, successors, executors, administrators, or assignees, whose actions, etc., are or might be in any wise disturbed, delayed, hindered or defrauded by such practices"; unless such transfer or incumbrance was made upon a good consideration and *bona fide* to one not having notice of the fraud.

This statute includes every kind of property which creditors of a transferor have a legal right to seize and sell in satisfaction of their claims. It is not necessary that the transferor be guilty of actual fraud. He may believe that it is his moral duty to give the property in question to the transferee, but if such gift leaves him insolvent—unable to pay his lawful debts—its necessary consequence is to hinder and delay his creditors; to take from them property which the law permits them to claim, and divert it to the use of others who have no such right. Such conduct is properly characterized as fraudulent, for it is a breach of the legal duty 'to be just before one is generous.' The statute does not apply to property which is exempt from creditors' claims; nor does it confer any benefit upon creditors who become such after the conveyance is made. A transfer of property may be set aside, however, by subsequent creditors if it was made with actual attempt to defraud them.

The second statute above named to refers only to purchasers of lands—avoiding all conveyances

of real estate interests "made for the intent to defraud and deceive such persons as shall purchase the same lands." In England it is held that a voluntary conveyance of real estate, even for a meritorious purpose, such as providing for wife and children, is within the policy of the statute, and may be set aside by any subsequent purchaser for value, although he buys with notice of such conveyance. In this country, however, the doctrine is limited to purchasers for value and without notice.

Conveyances of the character under consideration are not absolutely void; they are only voidable. As between the parties to the transaction they are binding. Even when impeached by creditors and purchasers, they are set aside only to the extent necessary to give effect to the rights of complainants.

Consult: May, *Treatise on the Statutes of Elizabeth Against Fraudulent Conveyances* (2d ed., London and Philadelphia, 1887); Bump, *Treatise Upon Conveyances Made by Debtors to Defraud Creditors* (4th ed., Washington, 1896); Wait, *Treatise on Fraudulent Conveyances* (3d ed., New York, 1897); Hunt, *The Law Relating to Fraudulent Conveyances* (London, 1897).

FRAUENBURG, frau'en-böörk. A town in the Government-District of Königsberg, Prussia, 41 miles southwest of Königsberg (Map: Germany, J 1). Copernicus was once Canon of Frauenburg, and died there. The fine Gothic cathedral contains his tomb. Population, in 1900, 2492.

FRAUENFELD, frau'en-fält. The capital of the Canton of Thurgau, Switzerland, situated in a beautiful and fertile district on the Murg, 23 miles northeast of Zurich (Map: Switzerland, C 1). It is regularly built, and has among its buildings a Catholic church dating from 1286, and an old castle, the Government building, containing the cantonal archives and library, the town hall, and the military barracks. There is a technical school with scientific and historical collections. The town manufactures gloves, cotton and iron goods, guns, machinery and leather, and is also a centre of trade for wine, fruit, and agricultural products. Population (commune), in 1900, 7861.

FRAUENLOB, frau'en-löb (Ger., ladies' praise) (c.1250-1318). The assumed name of Heinrich von Meissen, one of the German minnesingers (q.v.). He is said to have established the first school of minstrelsy in Mainz, and so to have made himself a 'mastersinger' (q.v.) also. In token of appreciation for his chivalrous devotion to 'ladyhood,' ladies of Mainz are said to have borne his body to the grave in the cathedral. During the Werther period of German literature ladies restored his tombstone in 1783, and near it other ladies, in 1842, erected a beautiful monument. Frauenlob's erudite and artificial poems have been edited by E. H. Müller (1843), and his *Cantica Canticorum* has been translated into English.

FRAUENSTÄDT, frau'en-stët, JULIUS (1813-79). A German philosopher, born at Bojanowo, Province of Posen, Prussia. He studied theology and philosophy at Berlin, and subsequently became one of the most ardent disciples of Arthur Schopenhauer. Many of his works reflect the influence of that profound thinker, whose ideas Frauenstädt extends, but frequently also subjects

to some modification. Some of his more important works are: *Die Naturwissenschaft in ihrem Einfluss auf Poesie, Religion, Moral und Philosophie* (1855); and *Neue Briefe über die Schopenhauersche Philosophie* (1876); *A. Schopenhauer: Lichtstrahlen aus seinen Werken* (7th ed. 1891). He also edited the first complete edition of Schopenhauer's collected works (1873-74).

FRAUNCES'S TAVERN. One of the oldest buildings of New York City, at the southeast corner of Broad and Pearl Streets; originally a mansion of the Delanceys, and subsequently transformed into a tavern. Washington made it his headquarters after the British evacuation of New York, and in it took farewell of his officers on December 4, 1783. The New York Chamber of Commerce was organized in it in 1768. In 1902 it was purchased by the city to be preserved as an historic memorial.

FRAUNHOFER, frau'hö-fër, JOSEPH VON (1787-1826). A distinguished Bavarian optician and physicist, born at Straubing. In 1799 he was apprenticed to a glass-cutter in Munich, and in 1806 was received, as a working optician, into the establishment of Reichenbach & Utzschneider at Benedictbeuern, of which he later became the head, and which afterwards, in 1819, was removed to Munich. While there, he acquired considerable wealth and reputation through his inventions, and soon afterwards became proprietor of the establishment. He was especially successful in producing large pieces of optical glass free from imperfections, which could be used for prisms and lenses, and as he combined the mechanical skill and technique of the optician with the theoretical knowledge and mathematical training of the physicist, his instruments were always in demand. He invented a machine for polishing parabolic surfaces, and was the first one who succeeded in polishing lenses and mirrors without altering their curvature. Prisms made under his direction were celebrated for being free from inequalities and striæ. His inventions are numerous, and include a heliometer, a micrometer, an achromatic microscope, besides the great refracting telescope at Dorpat. But that which has rendered Fraunhofer's name celebrated throughout the scientific world is his discovery of the dark lines in the spectrum, which are now known by his name. (See SPECTROSCOPY.) He was the first to obtain a spectrum from a grating (see DIFFRACTION AND DIFFRACTION GRATINGS), and with this apparatus was able to measure the wave-length of sodium light. Fraunhofer was a diligent student and investigator as well as a successful instrument-maker, and was elected a member of the Munich Academy of Sciences (1817), and five years later became conservator of its physical cabinet.

FRAUNHOFER LINES. See SPECTROSCOPY.

FRAXINEL'LA. See DITTANY.

FRAXINUS. See ASH.

FRAY GERUNDIO, frä'e hä-röön'dé-ö. See LAFUENTE, MODESTO.

FRAY GERUNDIO DE CAMPAZAS, dà kám-pä'thäs. A romance by Isla (1758), satirizing the degraded type of pulpit oratory of the period in Spain.

FRAYSSINOUS, frâ'sé'nôô', DENIS, Count de (1765-1841). A French prelate, born at Curières. He became known at Paris for his pulpit oratory, and in 1816 was appointed Court preacher and first almoner to Louis XVIII. In 1824 he became Minister of Public Worship, but in 1828 resigned the post. He was compelled to leave France at the time of the July Revolution. In his own day his *Défense du christianisme* (3 vols. 1825) attracted great attention. The work was republished at Paris in 1889 (2 vols.). Consult the biography by Henrion (Paris, 2 vols. 1844).

FRAZER, JOHN FRIES (1812-72). An American scientist, born in Philadelphia, Pa. He graduated in 1830 at the University of Pennsylvania, in 1836 was appointed first assistant geologist in the first geological survey of Pennsylvania, and from 1836 to 1844 was instructor in chemistry and natural philosophy at the Philadelphia High School. From 1844 until his death he was professor of natural history and philosophy in the University of Pennsylvania. He was also vice-provost of the university in 1855-68. For some time he was connected with the Franklin Institute as a lecturer, and edited the *Journal* of the Institute, to which he contributed several papers, which constitute the most important part of his published writings. He was elected to the American Philosophical Society in 1842, and in 1863 became a charter member of the National Academy of Sciences.

FRAZER, PERSIFOR (1844—). An American geologist, born in Philadelphia, Pa. He graduated at the University of Pennsylvania in 1862, was an aide on the United States Coast Survey in 1862-63, served as acting ensign in the Mississippi Squadron in 1863-65, and from 1866 to 1869 studied in the School of Mines at Freiberg, Saxony. In 1869-70 he was mineralogist and metallurgist on the United States Geological Survey, in 1870-74 was professor of chemistry in the University of Pennsylvania, and from 1874 to 1882 was assistant in connection with the second geological survey of Pennsylvania. Among his contributions to science may be cited his explanation of the cause of the white color of the moon as observed by day. He was elected to the American Philosophical Society in 1871. His publications include, in addition to four volumes of reports of the second geological survey of Pennsylvania: *Tables for the Determination of Minerals* (1874; 4th ed. 1896); *Bibliotics, or the Study of Documents* (1894; 3d ed. 1901), on which subject he is an authority, and upward of three hundred contributions to scientific periodicals.

FRAZIER'S or **FRAYSER'S FARM**, BATTLE OF; also called the BATTLE OF GLENDALE, the BATTLE OF CHARLES CITY CROSS ROADS, and the BATTLE OF NELSON'S FARM. A battle fought at Glendale, Va., about twelve miles southeast of Richmond, on June 30, 1862, during the Civil War, between a Federal force under General McClellan and a Confederate force under Generals Longstreet and Hill. The losses were about 1800 on the Federal and about 2000 on the Confederate side.

FRÉCHETTE, frâ'shét', LOUIS HONORÉ (1839—). A French-Canadian poet. He was born at Point Lévi, P. Q., and was educated at the

Quebec Seminary and Laval University. He was called to the bar in 1864, but was in newspaper work in Chicago for the following six or seven years. In 1874 he represented his native town in the Dominion Parliament, and practiced his profession in Quebec until 1879, when he went again into journalism, and successively edited three French papers, respectively in Quebec, Montreal, and Chicago. He is the representative poet of French Canada, and his productions have brought him honor from many societies, including the French Academy and the Imperial Institute, London. He was also made a knight of the Legion of Honor, and served as president of the Royal Society of Canada. His literary work includes a five-act play, entitled *Veronica*, and other dramas, one sketch in English called *Christmas in French Canada* (1899), and a few prose essays in French, and translations of Howells's *Chance Acquaintance*, and Cable's *Creole Days* into his native tongue; but he will be best remembered by his poems: *Mes loisirs* (1863); *La voix d'un exilé* (1869); *Pêle-mêle* (1877); *Les fleurs boréales* (1880); *Les oiseaux de neige* (1880); *La légende d'un peuple* (1887); and *Les feuilles volantes* (1891).

FRECKLES, frék'k'lz (older form *frecken*, from Icel. *freknur*, freckles; ultimately connected with Gk. *περκνός*, *perknos*, spotted), sometimes called *lentigo*. Small yellowish or brownish-yellow irregularly rounded spots, from the size of a pin's head to that of a split pea, frequently seen on the skin, especially of fair or reddish-haired persons, though they are seen even in mulattoes. They are not often met with under the age of six or eight. They are most common on the face, but often occur on the hands, and sometimes elsewhere. They are always most distinct in summer; but though the influence of the sun's rays undoubtedly increases their distinctness, it is doubtful whether it can cause them. They are due to increased local deposit of pigment-granules in the epidermis; and it may be noticed that persons subject to them do not bronze uniformly under the influence of exposure nearly so deeply as others. Many methods of treatment have been advocated for their removal; but in most cases they return upon exposure to the sun. Among the milder measures which sometimes succeed in improving the condition is a solution of hyposulphite of soda, 15 to 30 grains, or of chloride of ammonium, 15 grains to the ounce of water.

FREDEGAR, or **FREDEGAR'RIUS SCHOLASTICUS**. A chronicler of the Franks, who lived in the seventh century. He was one of the three compilers of the *Historia Francorum*, or a history of the Franks down to the year A.D. 642. The work is written in corrupt Latin, but is of great value as a source for the history of France during the first half of the seventh century. During the eighth century it was continued in the so-called *Gesta Francorum*. Consult Kruselis, *Fredегarii et Aliorum Chronica* (Hanover, 1888).

FREDEGUNDA (c.545-597). A Frankish queen. Originally a servant of Audovere, wife of Chilperic of Neustria, she soon won the King's heart, and got him to put his wife in a convent and to divorce her. But Chilperic married Galsvintha, and put away Fredegunda. Galsvintha

died in the same year (567), probably strangled by Fredegunda, who succeeded her as Queen. This brought on war between Chilperic and his brother Sigibert, King of Austrasia, and a bitter rivalry between Fredegunda and Brunhilda, sister of the murdered Queen and wife to Sigibert, who was soon assassinated by Fredegunda's agents at Vitry (575). Chilperic's sons by Audovere also died suddenly, and in 584 Chilperic was murdered, and by contemporary historians the Queen was accused of instigating all three murders. Now, with her son Clotaire upon the throne, she put forth all her efforts to kill Brunhilda and her son Childebert, and, unsuccessful in this, made war on Austrasia after Childebert's death, obtained possession of Paris and other cities, but died in the following year. See BRUNHILDA.

FREDERIC, HAROLD (1856-98). An American novelist and journalist. He was born in Utica, N. Y., August 19, 1856, and was London correspondent of the *New York Times* from 1884 till his premature death in Hornby, England, October 19, 1898. He was educated in Utica, worked at journalism there, in Albany, and in New York; but won distinction for novels, chiefly of rural life in central New York, written after his going to England. His first important story, *Seth's Brother's Wife* (1887), was followed by *The Lawton Girl* (1890); *In the Valley* (1890), a story of 1777; *The Return of the O'Mahoney* (1892); *The Copperhead* (1894), a story of the Civil War; and *Marsena* (1895), a collection of keenly humorous character stories. All these, however, were surpassed by *The Damnation of Theron Ware* (1896), a brilliant analysis of religious life in the American middle class, minutely realistic in detail, clever in conversation, and unflinching in psychic insight, immediately recognized by the public as a human document. His last works, *March Hares* (1896), *Gloria Mundi* (1898), and *In the Marketplace* (1899), were less significant. *The New Exodus* (1892) was a study of Anti-Semitism, the result of a visit to Russia, undertaken in 1891.

FREDERICH, FRÄDE-RIK, BERTHA (pseudonym, GOLO RAIMUND) (1825-82). A German novelist, born at Hanover. She was the wife of Eduard Frederich, editor of the *Hannoverscher Courier*, in which paper her first efforts appeared. In order to conceal her identity more effectually, she not only chose the above pseudonym, but managed to have the true authorship of her novels ascribed to a fictitious personage, "Georg Dannenberg." She wrote, in all, about twenty-two novels, nearly all of which have been republished. Among them are: *Bauernleben* (3d ed. 1888); *Zwei Bräute* (4th ed. 1888); *Schloss Elkrath* (3d ed. 1885); *Von Hand zu Hand* (2d ed. 1885); *Mein ist die Rache* (3d ed. 1885); *Zwei Menschenalter* (3d ed. 1886); *Ein deutsches Weib* (5th ed. 1886).

FREDERICIA, FRĖD'ÆR-Is'ſ-A. A seaport of Denmark, situated on the east coast of Jutland, on a projecting tongue of land, at the northern entrance to the Little Belt (Map: Denmark, C 3). The town is surrounded by fortifications, now falling into ruins, and has a famous bronze statue, "The Danish Soldier," erected in commemoration of the victory of the Danes over the Schleswig-Holstein forces in 1849. Fredericia is connected with Strib, on the island of Fünen,

by steamer, and carries on a considerable trade in exports of meat, fish, eggs, and imports of salt and petroleum. Population, in 1890, 10,000; in 1900, 12,700.

FREDERICK. A city and the county-seat of Frederick County, Md., 60 miles west-northwest of Baltimore; on the Baltimore and Ohio and the Pennsylvania railroads (Map: Maryland, H 3). It is situated in a beautiful and fertile valley near the famous battlefields of Monocacy and South Mountain. It is the seat of a State institution for the deaf and dumb, and Women's College (Reformed Church), organized in 1893, and has Boyd Academy and other educational institutions, and Emergency Hospital. There are large canning establishments, brick-works, planing-mills, and manufactures of flour, tobacco, fibre brushes, hosiery, leather, shutter-fasteners, and coaches. The government is administered under a charter of 1898 by a mayor, elected every three years, who controls the appointments to all municipal offices except that of city register, and a council elected at large. The city owns and operates its water-works and electric-light plant. Population, in 1890, 8,193; in 1900, 9,296. Frederick has been made famous by Whittier as the scene of Barbara Frietchie's exploit. Francis Scott Key, the author of the "Star-Spangled Banner," is buried in Mount Olivet Cemetery, and a splendid monument to him marks its entrance; and the remains of Roger B. Taney (q.v.) lie in the burial-grounds of the Roman Catholic Church. Frederick was first settled in 1745, and was incorporated in 1817. In 1755 Washington met Braddock here to prepare for the expedition against the French. Near by Robert Strawbridge, in 1764, organized a Methodist church, 'the first in Maryland and America.' Consult a sketch in Powell's *Historic Towns of the Southern States* (New York, 1900).

FREDERICK I. (1121-90). Holy Roman Emperor from 1152 to 1190, surnamed Barbarossa or Redbeard. He was born in 1121, succeeded his father, Frederick, as Duke of Swabia, in 1147, and his uncle, Conrad III., as King of Germany, in 1152. On his father's side he belonged to the Hohenstaufen family; on his mother's side to the Guelphs. In the early years of his reign Frederick reduced Germany to order, and then proceeded to reestablish the Imperial authority in Italy. The Lombard cities, with Milan at their head, flourishing and powerful, and strengthened by the Papal power in their opposition to the Imperial pretensions, were prepared to resist Frederick's attempt to subjugate them. After receiving the Lombard crown at Pavia, Frederick marched in 1155 to Rome, reinstated the authority of Pope Adrian IV., to whom he delivered up Arnold of Brescia, and was crowned Holy Roman Emperor. In 1158 he besieged and took Milan. In the same year, at a Diet held at Roncaglia, Frederick imposed upon the Lombard cities a full feudal régime. Although the cities submitted for the moment, they soon rebelled. In 1159 began the long contest between Frederick Barbarossa and Pope Alexander III., the successor to Adrian IV. The Emperor created an antipope in the person of Victor IV., the first of several antipopes set up by him. The city of Crema was reduced by Frederick after a long siege in 1160, and in 1161-62 he besieged and took Milan, and razed it to the ground. Frederick was tri-

umphant everywhere; but in 1167 the Lombard cities formed a league against him and renewed the struggle. Frederick was completely defeated at Legnano in 1176; and in 1183, in a peace concluded at Constance, he finally agreed to leave the Lombard cities the right to choose their own municipal rulers, and to conclude treaties and leagues among themselves, although he retained his suzerainty over them, together with the power of imposing certain fixed taxes. The difficulty of settling the Italian differences had been aggravated by the attitude of Pope Alexander III. At last, in 1177, Frederick made his peace with the Pope, and was enabled to turn his attention to Germany, where he had to contend with Henry the Lion (q.v.), Duke of Bavaria and Saxony, the powerful head of the House of Guelph. By his energetic measures Frederick succeeded in thoroughly humbling his troublesome vassal, and crushing the Guelph power in Germany. In 1189, having settled the affairs of the Empire and proclaimed universal peace in his dominions, he resigned the government to his eldest son, Henry, and at the head of about 100,000 men set forth for the Holy Land. After gaining two great victories over the Moslems at Philomelium and Iconium, he was drowned in the Calycadnus, a small stream in Cilicia (1190). His remains were rescued by his son, and buried at Tyre. The death of Frederick, which led to the dispersion of the Crusaders before any material advantage had been obtained over the infidels, excited the deepest grief in Germany, where his memory has always been cherished as that of the best and greatest of his race. Frederick made Poland tributary to the Empire, raised Bohemia to the rank of a kingdom, and erected the Margraviate of Austria into an independent hereditary duchy. He was a patron of learning, and enacted many admirable laws, some of which were based upon the Roman law. Consult: Prutz, *Kaiser Friedrich I.* (3 vols., Danzig, 1871-73); Fischer, *Kreuzzug Friedrichs I.* (Leipzig, 1870); Giesebrecht, *Geschichte der deutschen Kaiserzeit*, vol. v. (Leipzig, 1880-95).

FREDERICK II. (1194-1250). King of Sicily from 1197, and Holy Roman Emperor from 1215 to 1250. He was a grandson of Frederick I., and the son of the Emperor Henry VI. and of Constance, heiress of Sicily. He was born at Jesi, near Ancona, in Italy, December 26, 1194. His mother secured the favor of Pope Innocent III. for her infant son by conceding many important privileges to the Papal chair; and on the death of Constance, in 1198, the Pope became the guardian of the young Prince. As early as 1208 Frederick assumed the reins of government in his realm, which included South Italy in addition to Sicily. Supported by the Pope, Frederick, in 1212, engaged in a contest for the Imperial throne of Germany, with Otho IV., who had as yet not succeeded in securing himself in its possession after his long struggle with the rival claimant, Philip of Swabia, assassinated by Otho of Wittelsbach, in 1208. The blow dealt to Otho IV. by Philip Augustus of France in 1214, in the battle of Bouvines, secured the triumph of Frederick, who was crowned at Aix-la-Chapelle in 1215. On his coronation Frederick took a vow to go on a crusade. Having secured the election of his son Henry as King of the Romans, and leaving Archbishop Engelbert of Cologne as his vicegerent, he went to Italy, and was crowned

Emperor at Rome, by Pope Honorius, in 1220. Frederick now devoted himself to the task of organizing his Italian territories. He founded the University of Naples, gave encouragement to the medical school of Salerno, invited to his Court men of learning, poets, and artists, and commissioned his Chancellor, Petrus de Vineis, to draw up a code of laws. Frederick, however, was hampered in his projects by the refractory conduct of the Lombard cities, which in 1226 renewed the league formed against Frederick Barbarossa, and still more by the opposition of the popes. As he delayed going on a crusade, he was threatened with excommunication unless he fulfilled his pledge. Being compelled to depart on this expedition, he made the necessary preparations for its prosecution, and actually started in 1227. He returned in three days, saying that he was ill, whereupon Gregory IX., the successor to Honorius III., excommunicated him. In 1228 Frederick again set out for the Holy Land. This second expedition proved successful, and in 1229 Frederick made a ten years' truce with the Sultan of Egypt, who gave up Jerusalem and the territory around Jaffa and Nazareth, Frederick crowning himself King of Jerusalem. The rest of his life was spent in attempting to bring his rebellious Lombard subjects to subjection, and in struggles with Popes Gregory IX. and Innocent IV. He died suddenly in 1250. Frederick II. was famed for his talents as a minnesinger, for his skill in all knightly exercises, and for his varied learning. He was tolerant in matters of religion, and in his reforms showed himself far in advance of his time. His strong sympathies with his Italian mother-land, and his unrelenting endeavors to establish a compact and all-supreme empire in Italy, were the causes, not only of his own misfortunes, but of the miseries which he brought upon Germany; for, by embroiling him in costly wars abroad, they led him to neglect the welfare of his German subjects. Consult: Huillard-Bréholles, *Historia Diplomatica Friderici Secundi* (12 vols., Paris, 1852-1861), the first volume of which gives an excellent account of him; Blondel, *Etude sur la politique de l'empereur Frédéric II. en Allemagne* (Paris, 1892). See HOHENSTAUFEN.

FREDERICK III. (1415-93). Holy Roman Emperor from 1440 to 1493; as German King, Frederick IV. He was the son of Ernest, Duke of Austria, and was born September 21, 1415. After the death of the Emperor Albert II., in 1439, he was elected his successor in 1440, and two years afterwards he was solemnly crowned at Aix-la-Chapelle. Ten years later he received the Imperial crown at the hands of the Pope. In the Concordat of Vienna with the Papacy, concluded in 1448, in the bringing about of which the Emperor's adviser, Æneas Sylvius (the future Pius II.), had an important share, the Church in Germany sacrificed the advantages obtained by the restrictions imposed upon Papal authority at the Council of Basel. Frederick's only desire was to increase the hereditary possessions of his house. He failed to get the crown of Hungary, to which he laid claim, and even lost possession of Austria for a time, Vienna itself falling into the hands of the Hungarian King, Matthias Corvinus. He did nothing to check the progress of the Turks. He died in 1493, after an inglorious reign of fifty-three years. In 1477 he married his

son and successor Maximilian to Mary, the heiress of Charles the Bold of Burgundy. From his time the Imperial dignity continued permanently in the House of Austria. Consult: *Aeneas Sylvius, Historia* (Strassburg, 1685); Coxe, *House of Austria* (3d ed., London, 1847).

FREDERICK I. (c.1471-1533). King of Denmark and Norway, from 1523 to 1533. With his elder brother John he was joint ruler of the duchies of Schleswig and Holstein at the time his nephew Christian II. was dethroned (1523). Frederick was elected to succeed him. A long war, waged for the possession of Norway, ended in his favor. He showed great cruelty to his unfortunate relative, whom he detained in close captivity; but he was an able ruler. He embraced the Lutheran faith, which spread in his dominions. He granted the nobility many privileges at the cost of the power of the Crown.

FREDERICK III. (1609-70). King of Denmark from 1648 to 1670. He was the son of King Christian IV., and in his youth held several high ecclesiastical offices, being made Bishop of Verden in 1623 and Archbishop of Bremen in 1634. On the death of his father in 1648 he became King of Denmark and Norway. The country had been reduced by war to a state of great misery, but Frederick nevertheless plunged into a struggle with Sweden (1657) in the hope of regaining the provinces which had been lost by the treaty of Brömsebro in 1645. Poland, Brandenburg, and Holland were his allies. Charles X. of Sweden invaded Jutland, overran Fünen and Zealand, and forced Frederick to sign the Treaty of Roeskilde, February 28, 1658, by which a number of the Danish islands and a portion of Norway were ceded to Sweden. Hostilities were resumed by the Swedes in the same year, but Frederick, with the aid of Brandenburg, succeeded in expelling the Swedes from Jutland, and Charles X. was compelled to raise the siege of Copenhagen in 1659. Abandoned, however, by his allies, Frederick was forced to conclude peace in 1660, on the most unfavorable terms, being obliged to relinquish all claims to the territories which Denmark had possessed in the Swedish part of the Scandinavian peninsula. The latter part of his reign was rendered memorable by the transformation in the nature of the government, which was changed to an hereditary and absolute monarchy by the voluntary act of the commons and clergy, who, out of hatred for the nobility, surrendered to the Crown the liberties and prerogatives which they had hitherto enjoyed.

FREDERICK V. (1723-66). King of Denmark from 1746 to 1766. He was the son and successor of Christian VI., and one of the best and wisest of the absolute monarchs of his time. With the exception of a threatened attack by Peter III. of Russia, nothing disturbed the peace of his reign. Denmark owed to him the increase of her national wealth, and the encouragement of various branches of commerce and manufacture. Frederick established the Asiatic Company, opened the American colonial trade to all his subjects, founded the military academy of Sorø, in Denmark, and caused schools to be opened at Bergen and Trondhjem, in Norway, for the instruction of the Laplanders. He established academies of painting and sculpture at Copenhagen, and sent a number of learned men—among whom was

Niebuhr, the father of the historian—to travel and make explorations in the East.

FREDERICK VI. (1768-1839). King of Denmark from 1808 to 1839, and of Norway from 1808 to 1814. He was the son of Christian VII. and Caroline Matilda of England, and assumed the regency in 1784, on account of the insanity of his father, on whose death, in 1808, he ascended the throne. During his reign serfdom was abolished in Denmark and Schleswig-Holstein, monopolies were abrogated, the criminal code was amended, and the slave trade prohibited. All this was largely the work of Frederick's great Minister, Bernstorff (q.v.). In 1800 Denmark joined the armed neutrality of the North, formed against England by Russia, Sweden, and Prussia. This led to the seizure by England of all Danish vessels in British ports, and to the dispatch of a powerful fleet, under Sir Hyde Parker and Nelson, to force the Regent to withdraw from the convention. His refusal was followed by a fierce naval engagement at Copenhagen (April 2, 1801), in which the Danish fleet was almost wholly destroyed. A peace was concluded on the Regent's withdrawal from the confederation; but in consequence of his persistence in maintaining an attitude of neutrality, instead of combining with Great Britain against Napoleon, the war was renewed in 1807 by the appearance before Copenhagen of a British fleet. Copenhagen was bombarded for three days (September 2-5), the arsenals and docks destroyed, and all the shipping disabled, sunk, or carried to England. This blow paralyzed the national resources, and brought ruin on the country. In retaliation Frederick became the ally of Napoleon, and suffered in consequence. In 1814 Norway was taken by the Allies from Denmark and given to Sweden. The State became bankrupt, and many years passed before order could be restored to the finances. Notwithstanding his autocratic tendencies, Frederick so far yielded to the movements of the times as to establish representative provincial councils in 1831-34. He died December 3, 1839. Consult Giessing, *Zur Regierungsgeschichte Friedrichs VI.* (Kiel, 1851-52).

FREDERICK VII. (1808-63). King of Denmark from 1848 to 1863. He succeeded his father, Christian VIII., who died January 20, 1848. The principal events of his reign were the wars and diplomatic negotiations arising out of the revolt of the duchies of Schleswig and Holstein, and the dispute over the succession to Denmark proper and the duchies on the death of the King and of his uncle, the heir presumptive, both of whom were childless. Notwithstanding the heavy expenses of the Schleswig-Holstein War (1848-51), the material prosperity of the country increased during Frederick's reign. See SCHLESWIG-HOLSTEIN.

FREDERICK I. (1657-1713). The first King of Prussia, 1701 to 1713; previous to his assumption of the royal title, Elector of Brandenburg (1688-1701), as Frederick III. He succeeded his father, Frederick William, the Great Elector of Brandenburg, in 1688. His name is a synonym for vanity and extravagance, but his subjects, nevertheless, loved him, and his expenditures did not greatly affect the condition of the national finances. In the first half of his reign his main concern was the acquisition of the royal title, in which endeavor he was assisted

by the difficult position of the Emperor Leopold I., who pledged his consent, after a year of negotiation, on the eve of the outbreak of the War of the Spanish Succession. In return for the Imperial permission, Frederick was to furnish a considerable body of troops and in general to further the interests of Austria. His troops helped to win the day for the Allies on more than one occasion, yet at the Peace of Utrecht his only reward was a small district in Gelderland. In this treaty Prussia was, however, recognized in the possession of Neuchâtel, which had fallen to her by inheritance. Frederick I. is remembered to-day as the patron of learned and liberal-minded men—of Spener, Francke, and Thomasius, and above all of Leibnitz. He is also known as the founder of the Order of the Black Eagle, which is still considered the greatest mark of distinction that a King of Prussia can bestow. Frederick died February 25, 1713. Consult: Henderson, *Short History of Germany* (New York, 1902); Pierson, *Preussische Geschichte* (Berlin, 1898); Tuttle, *History of Prussia* (Boston, 1884-88).

FREDERICK II. (1712-86). King of Prussia from 1740 to 1786, known as **THE GREAT**. He was born January 24, 1712, and was the son of Frederick William I. (q.v.) of Prussia and of Sophia Dorothea, daughter of George I. of England. The plan of education pursued by his father soon tended to render their relations unbearable. Frederick William insisted on instilling into his son his own practical instincts, and stifled the literary and artistic impulses which Frederick manifested at an early age. For the son's faults, his inclination to extravagance and self-indulgence, the father had nothing but the harshest repressive measures. At last Frederick determined to escape the parental tyranny by flight to England. The plot was discovered, and the most severe punishment followed. Frederick's aider and abettor, Lieutenant Katte, was beheaded before his eyes, and the Prince himself was led to expect a similar fate. The father, however, relented, and Frederick was placed, instead, in the War and Domain Bureau at Cölln, and made to work as an assistant clerk. Here he learned most valuable lessons with regard to the task of administering a great kingdom. A reconciliation finally took place between father and son. The only act which Frederick never forgave his father was his forced marriage, for reasons of State policy, with Elizabeth of Brunswick-Bevern, whom he respected but never loved.

Frederick's great wars fall in the first half of his reign. Almost immediately after his accession, on the news of the death of the Emperor Charles VI., and the accession of his daughter, Maria Theresa, in the Hapsburg dominions, he invaded Silesia, basing his claim to a large part of the country on an old transaction in which Austria had played a grasping and dishonest part. (See **SUCCESSION WARS**.) In the first battle of the Silesian campaign—that of Mollwitz, April, 1741—Frederick's General (Schwerin) found the situation so critical that he urged the King to fly for his life, and Frederick did not know until the next day that he had won the victory. Mollwitz gained for Frederick the French alliance, and practically decided the campaign. After the victory of Frederick at Chotau-

sitz, Maria Theresa agreed to the Peace of Breslau (1742), in which France, however, was not included. In this treaty Austria ceded most of Silesia to Prussia. Two years later Frederick reentered the struggle, ostensibly as the champion of the Emperor, the Bavarian Charles VII. France was still his ally, while Maria Theresa could count on England, Saxony, and Holland. Frederick took Prague, but was forced to abandon the city and make a disastrous retreat. He soon retrieved his fortunes, however, at Hohenfriedberg (June, 1745), and his victory over the Saxons at Kesseldorf (December, 1745) was followed by the Treaty of Dresden, which was a repetition of the Peace of Breslau. In 1756 Maria Theresa, inconsolable for the loss of Silesia, formed an alliance against Prussia with France (the old enemy of the Hapsburgs), Russia, Saxony, and Sweden. England, as the enemy of France, now sided with Frederick. The King of Prussia at once descended upon Saxony, thus opening the great struggle which involved all the European powers and their colonies. (See **SEVEN YEARS' WAR**.) The outcome of this gigantic conflict, which was the culmination of Frederick's military career, but which taxed the resources of his little kingdom to their utmost, left Prussia in 1763 territorially unchanged, and in the enjoyment of great military prestige.

Frederick had come through the war without incurring a national debt or increasing the direct taxes; on the other hand, he had inflated the currency; but by wise measures he soon put the finances of Prussia on a sound basis. He practiced the most rigid economy in the royal household, and was enabled to spend large sums in agricultural and industrial improvements. He reclaimed thousands of acres of waste land by a system of canals and drainage, peopled them with colonists, and set on foot a large number of industries, visiting at intervals every part of his dominions. He began a codification of the law, abolished serfdom within the royal domains, insisted on the impartial administration of justice, granted freedom of speech, and, at least in literary and scientific matters, liberty of the press. Tolerant toward every form of religious belief, he was one of the most intolerant of autocrats toward his Ministers. To his enlightened despotism were due the regulation of customs and the equalization of taxation. He grimly put a tax on the hired Hessians that passed through his dominions, as 'on cattle bought and sold.' Frederick took a great interest in the American Revolution, and admired and appreciated the greatness of Washington, and was one of the first sovereigns to conclude a commercial treaty with the United States. The desertion of Prussia by England at the critical period in the Seven Years' War had inspired in Frederick a bitterness toward the latter country which permanently influenced his foreign policy. On the other hand, he had drawn closer to Russia after the death of his uncompromising enemy, the Empress Elizabeth, and he and Catharine II. were able to see their value as allies to each other; hence the partition of Poland.

Frederick's relation to the intellectual development of Germany was peculiar. Although Prussia had become through him one of the great Continental powers, he had no sympathy whatever with German national aspirations. While he foresaw the future literary greatness of Ger-

many, he ignored the eminent writers who were appearing upon the scene, and despised the German language, which he never wrote with ease. French he spoke and wrote fluently, though he did not spell it correctly. He cultivated the society of French writers and scholars, among them Voltaire and Maupertuis, whom he invited to Sans-souci. He was consistent in his admiration of Voltaire, though not blind to his personal weaknesses. Conversation with his literary friends, and playing on the flute, on which he was a really skillful performer, were Frederick's only relaxation from incessant work. He was a voluminous writer. Of his numerous works, the most important are: *Mémoires pour servir à l'histoire de Brandebourg*; *Histoire de la guerre de Sept Ans*; and the *Anti-Macchiavel*, written before he became King, in which he laid down his views on government. The Berlin Academy published an edition of his collected works, in thirty volumes, edited by Preuss (1846-57).

Throughout his reign Frederick took the greatest interest in the improvement of the Prussian Army. He wrote for the guidance of his generals a number of works covering the whole science of war; and the army, which numbered 80,000 men when he ascended the throne, had been increased to nearly 200,000 in his lifetime. Frederick died August 17, 1786, at Sans-souci.

Consult: Tuttle, *History of Prussia Under Frederick the Great* (3 vols., Boston, 1888), the best work in English, unfortunately cut short at 1757 by the death of the scholarly author; Longman, *Frederick the Great and the Seven Years' War* (New York, 1881), a useful little compendium. Carlyle, *History of Frederick II.* (London, 1888), is, on the whole, inadequate as history. These are the principal useful works in English. The greatest living authority is Koser, whose *Friedrich der Grosse als Kronprinz* (Stuttgart, 1901) is a small classic. His larger history is nearing completion. See also Lavissee, *La jeunesse du grand Frédéric* (Paris, 1891), and *Le grand Frédéric avant l'avènement* (Paris, 1893); Preuss, *Friedrichs des Grossen Lebensgeschichte* (Berlin, 1832-34); Kugler, *Geschichte Friedrichs des Grossen* (12th ed. Leipzig, 1887); and numerous other general and special studies, a bibliography of which may be found in Lavissee and Rambaud, *Histoire générale*, vol. vii. (Paris, 1893-1900).

FREDERICK III. (1831-88). German Emperor and King of Prussia from March 9 to June 15, 1888. Before his accession to the throne he was known as Frederick William. He was the only son of William I., King of Prussia and first Emperor of united Germany, and was born October 18, 1831. His earnest character and decided talents were developed under the care of excellent masters, among others Ernst Curtius (q.v.), who accompanied him to the University of Bonn, where the Prince was matriculated in the law faculty. After the completion of his education, the Prince visited several foreign countries. In England he became attached to the Princess Royal, Victoria, to whom he was married, January 25, 1858. The marriage was highly approved by both nations, and the life of the royal couple was an exceedingly happy one. After his father's accession to the throne, the Crown Prince took part in the more impor-

tant affairs of the State. During the war with Denmark in 1864 he was sent to the scene of operations in order to exert his personal influence toward removing the friction among those in charge of affairs. In the war with Austria in 1866 he commanded the Second Prussian Army, and by a forced march arrived on the scene of the battle of Sadowa in time to decide the issue. In the Franco-German War he commanded the Third Army, consisting of the South German forces. He won the first victory of the war, that of Weissenburg (August 4th), and inflicted a decisive defeat on the army of MacMahon at Wörth (August 6th). Seconded by the Crown Prince of Saxony, he vanquished MacMahon at Sedan, and compelled him to surrender with his whole army (September 2d). Two weeks later he began the investment of Paris, and had the principal share in its reduction. He played a considerable part in the founding of the new German Empire, although his plans differed in some essential respects from those advocated by Bismarck. During the Emperor's illness, caused by an assassin's shot in 1878, his public functions were discharged by the Crown Prince, who showed great ability in the performance of his duties. In January, 1887, he was attacked by a cancerous throat trouble, necessitating several surgical operations, which were heroically borne. On the death of his father, March 9, 1888, he ascended the throne as Frederick III. He died June 15th of the same year. Liberal, cultivated, and a friend of parliamentary government, he was greatly beloved by all, especially by the army, and bore the popular appellation of "Unser Fritz." He wrote diaries of his travels in the East, and of his part in the wars of 1866 and 1870-71. He had eight children, the eldest of whom is the reigning Emperor, William II. (q.v.).

FREDERICK I. (1425-76). Elector Palatine, called the Victorious. At the death of his father, in 1439, a portion of the Palatinate devolved upon him, which he later ceded to his brother, Louis IV. In 1449, upon the death of Louis, he assumed the guardianship of his infant nephew Philip, and administered the Government. In 1451 the country, being troubled by warlike neighbors, Frederick persuaded the estates to invest him with the dignity of Elector for life, with the understanding that his children should not rank as princes, and that the succession should devolve upon his nephew. A coalition was at once formed against him, headed by the Emperor Frederick III.; but he defended himself ably, and in 1462 won a great victory over his enemies at Seckenheim. His success secured him undisturbed possession of his principality until his death. The territory of the Palatinate was greatly increased during his reign.

FREDERICK II. (1482-1556). Elector Palatine, surnamed the Wise. He was the fourth son of Philip the Magnanimous, and assumed the Electoral crown in 1544, succeeding his brother Louis. When, in 1529, the Sultan Solymán besieged Vienna, Frederick assumed command of the Imperial army. In 1535 he married Dorothea, daughter of Christian II., ex-King of Denmark. Through the teaching of Melancthon he became familiar with the principles of the Reformation, and joined the Schmalkald League. In later life he signed the Augsburg Interim.



FREDERICK THE GREAT
FROM A PAINTING BY GEORGE MEYN

FREDERICK III. (1515-76), Elector Palatine, surnamed the Pious. He succeeded his father, John II., in the ducal possessions of the Simmern Palatinate in 1557, and upon the extinction of the elder Palatine line became Elector Palatine in 1559. From Lutheranism, which he embraced in 1546, he passed over in 1561 to Calvinism, and by his energetic measures to impose his belief upon his subjects aroused the hatred of the Lutheran princes. As a fervent champion of Protestantism he lent aid to the adherents of the reformed religion in France and in the Netherlands. He laid the foundation of systematic Calvinism by causing the Heidelberg Catechism to be drawn up in 1563, devoting his personal attention to the work.

FREDERICK IV. (1574-1610). Elector Palatine, surnamed the Upright. He was the son of the Elector Louis VI. and Elizabeth of Hesse. His father died during his infancy, and Frederick succeeded to the throne in 1583, under the guardianship of his uncle, John Casimir, but only assumed the reins of government in 1592, upon his uncle's death. The steadfast and firm support he accorded to the Protestant cause renders his reign important. Through his influence the Protestant Union was formed in 1608. He raised Mannheim, where many Protestants had taken refuge, to the dignity of a town.

FREDERICK V. (1596-1632). Elector Palatine and King of Bohemia. He was the third son of the Elector Frederick IV., whom he succeeded in the Palatinate in 1610. He married, in 1613, Elizabeth, the daughter of James I. of England, through whose ambitious counsels he was induced to take a prominent part in the proceedings of the union of the Protestant princes of Germany, and finally, although against his own inclinations, to accept the dignity of King of Bohemia in 1619. His complete defeat at the battle of the White Hill, November, 1620 (see THIRTY YEARS' WAR), terminated his short-lived enjoyment of the regal crown, of which he retained no other memorial than the mocking title of 'the Winter King.' The rest of his life was spent in exile, under the ban of the Empire, and with no resources beyond those which he could obtain from the generosity of his friends. In 1623 he was declared to have forfeited his Electoral title and his dominions in the Palatinate. The Electoral dignity and the Upper Palatinate were conferred upon his cousin, Maximilian of Bavaria, the head of the Catholic League. Frederick's daughter Sophia became the wife of the first Elector of Hanover and the mother of George I. Her daughter married Frederick I. of Prussia, and was the grandmother of Frederick the Great. Consult Gindely, *Geschichte des dreissigjährigen Krieges* (Prague, 1869-80).

FREDERICK I. (1372-1440). First Elector of Brandenburg, of the House of Hohenzollern, originally Frederick VI., Burgrave of Nuremberg. After serving in the Hungarian Army he married, in 1401, Elizabeth of Bavaria, whose beauty and accomplishments were widely celebrated. As a reward for the support which he gave to Sigismund as candidate for the Imperial crown, he was given possession of Brandenburg in 1415, and in 1417 was invested with the Electoral dignity, thus becoming the founder of the royal Prussian dynasty.

FREDERICK III., ELECTOR OF BRANDENBURG. See FREDERICK I., King of Prussia.

FREDERICK I. (1369-1428). Elector and Duke of Saxony, called the Pugnacious. He was the son of Frederick the Stern, of Meissen. With his two brothers he succeeded, on the death of the father, in 1381, to the inheritance; but they were compelled to divide with their two uncles. Frederick distinguished himself as a soldier, and in 1423, in recognition of his successes against the Hussites, Emperor Sigismund made him Elector and Duke of Saxony. He was defeated by the Hussites at Aussig, in 1426. He founded the University of Leipzig, in 1409.

FREDERICK III. (1463-1525). Elector and Duke of Saxony, called the Wise. He was a grandson of Frederick II., and succeeded his father, Duke Ernest, in the Government. He founded the University of Wittenberg in 1502, and called Luther and Melancthon to chairs in the faculty. He never adopted the creed of the Reformers, but he accorded them toleration, protected Luther at the Diet of Worms, and sheltered him in the castle of Wartburg. In 1493 he visited the Holy Land, and in Jerusalem was made a Knight of the Sepulchre. He brought about many reforms in the constitution of the Empire, and on the death of Maximilian I., in 1519, he was offered the Imperial throne, but declined it, and recommended Charles I. of Spain, who became Emperor as Charles V. Consult Kolde, *Friedrich der Weise und die Anfänge der Reformation* (Erlangen, 1881).

FREDERICK II. (1720-85). Landgrave of Hesse-Cassel. He succeeded to the Government in 1760. He contributed greatly to the improvement and embellishment of the city of Cassel, which owes its Museum, its Academy of Fine Arts, and a number of the fine buildings which are at present its chief pride and boast, to him. In order to provide for his lavish expenditures, he sold a corps of 12,000 soldiers to England during the war of that country with the American colonies.

FREDERICK II., called PRINCE OF HOMBURG (1633-1708). A German general, Landgrave of Hesse-Homburg. He entered the Swedish service, and fought with great distinction at the siege of Copenhagen in 1659. It was, however, in the service of Brandenburg that he achieved the greatest celebrity. He was made general of cavalry by the Great Elector, Frederick William, and had a great share in the victory over the Swedes at Fehrbellin in 1675. In 1681 he succeeded his brother in Hesse-Homburg. The complete restoration of Homburg, now one of the most beautiful spas of Germany, was chiefly due to him.

FREDERICK I., WILLIAM CHARLES (1754-1816). Duke and subsequently first King of Württemberg. He was born at Treptow, Pomerania, and was a son of the famous Sophia Dorothea, niece of Frederick the Great. After serving in the Prussian and Russian armies, he in 1797 succeeded to the dukedom, and in 1803 was invested with the Electoral dignity. At the close of 1805, Napoleon, in reward for his alliance against Austria, erected his State into a kingdom, and on January 1, 1806, Frederick assumed the royal title. He soon afterwards joined the Confederation of the Rhine. Although the territory over which he ruled was greatly enlarged during

his reign, his autocratic government and subserviency to Napoleon I. found little favor among his subjects, upon whom the oppressive conditions imposed by enforced conscription, excessive taxation, and other evils weighed most heavily. Frederick joined the league against France after the battle of Leipzig.

FREDERICK I., WILLIAM LOUIS (1826—). Grand Duke of Baden. He was born at Karlsruhe, son of the Grand Duke Leopold and of Princess Sophia of Sweden. He was educated at the universities of Heidelberg and Bonn, and, after acting as Prince Regent for four years, succeeded to the Government in 1856. Immediately upon his accession to the throne he restored the Constitution of the grand duchy, and during a Government of nearly fifty years he has zealously endeavored to promote economic and educational progress. He sided with Austria in the war of 1866, but after the defeat of that power he deemed it best to enter into close relations with Prussia and the North German Confederation.

FREDERICK AUGUSTUS I. (1750-1827). Elector (as such Frederick Augustus III.), and from 1806 first King of Saxony. He was the son of the Elector Frederick Christian, and succeeded his father under the guardianship of his uncle, Prince Xavier, in 1763. In 1768 he was declared of age. In 1769 he married Princess Maria Amelia of Zweibrücken. He sided with Frederick the Great against Austria in the War of the Bavarian Succession (1778-79), and afterwards joined the League of German Princes. In 1791 he was offered the crown of Poland, but declined it. In 1792 he reluctantly took up arms against France. During the war between France and Austria, in 1805, he maintained a strict neutrality; but in the following year he joined Prussia against France. The disastrous battle of Jena forced him to conclude a treaty of alliance with Napoleon. December, 1806. He was allowed to assume the royal title, and joined the Rhenish Confederation. In 1807 he was invested with the newly created Duchy of Warsaw, but was ruler of it only in name, the control being exercised by Napoleon himself. During the subsequent wars of Napoleon he was a faithful ally of the Emperor. He was taken prisoner by the Allies after the entry into Leipzig, October 19, 1813, and by the decrees of the Congress of Vienna he was compelled to cede more than half of his kingdom to Prussia. He devoted the remainder of his life to the development of the agricultural, commercial, and industrial resources of his kingdom, and directed his attention especially to the administration of justice. He died at Dresden, May 5, 1827.

FREDERICK AUGUSTUS II. (1797-1854). King of Saxony from 1836 to 1854. He was the eldest son of Prince Maximilian of Saxony, and brother of Frederick Augustus I., and of Caroline Maria Theresa of Parma. In 1830, on the outbreak of political disturbances in Dresden, he was named joint Regent of the kingdom with King Anthony, and his wise measures speedily quelled all discontent. In 1836 he succeeded Anthony on the throne. In spite of the enlightened liberality of his administration, Saxony was not to escape the political troubles which assailed Germany in 1848. An insurrection in Dresden in May, 1849, obliged him to avail himself of the help of Prussian troops. But the rising once

quelled, his reign continued tranquil and prosperous. He died as the result of a fall from his carriage while traveling in Tyrol, August 9, 1854.

FREDERICK CHARLES (1828-85). Prince of Prussia. He was the only son of Prince Charles, brother of Emperor William I., and was educated at Bonn. He served with distinction in the early stage of the first Schleswig-Holstein war, which began in 1848. He next took part in the suppression of the revolutionary struggle in Baden in 1849, after which he devoted himself assiduously to the study of military science. Some time afterwards he delivered a lecture entitled "*Die Kampfweise der Franzosen*," which subsequently appeared in the form of a treatise, and was republished in France as *L'Art de combattre l'armée française* (1860). During the Danish War of 1864 he won laurels by storming the fortifications at Düppel (April 18, 1864), and in the following month he was intrusted with the chief command of the allied forces. He was commander of the First Division of the army during the conflict with Austria (1866), and after winning the skirmishes of Podol, Münchengrätz, and Gitschin in rapid succession, obstinately defended the Prussian centre at the battle of Sadowa until the arrival of the army of the Crown Prince. Still more conspicuous was his leadership during the Franco-German War of 1870-71, when he commanded the Second Army, consisting of six army corps, 500 guns, and 260,000 men. He defeated Bazaine at Vionville (Mars-la-Tour) on August 16, 1870, and two days later, seconded by General Steinmetz, at Gravelotte, ultimately compelling Bazaine to capitulate with his army of about 180,000 men, and to surrender the fortress of Metz (October 27th). He subsequently defeated the Army of the Loire, under General Aurelle de Paladines, after a campaign of six weeks. After the war he became inspector of Prussian cavalry.

FREDERICK FRANCIS II. (1823-83). Grand Duke of Mecklenburg-Schwerin. He was a son of Grand Duke Paul Frederick and of the Princess Alexandrine of Prussia, and was educated at Bonn. He ascended the throne in 1842, and in the same year he was appointed general in the Prussian Army, in which capacity he fought with distinction in the War of 1866. As commander of the Thirteenth Army Corps he participated in the siege of Metz (1870), and subsequently invested the fortress of Toul, which surrendered on September 23, 1870. In December he distinguished himself in the operations on the Loire. During the siege of Paris, where he commanded the divisions guarding the approaches to the besieging army, he acted for some time as chief of the General Staff. A magnificent monument was erected to his memory at Schwerin, in 1893.

FREDERICK LOUIS (1707-57). Prince of Wales. He was born at Hanover, Germany, the eldest son of George II. and Queen Caroline. He came to England at the age of seventeen, was appointed Prince of Wales in 1729, and married the Princess Augusta of Saxe-Gotha in 1736. He is described as of a generous but dissolute and unreliable character. His son afterwards came to the throne as George III.

FREDERICK WILLIAM (1620-88). Elector of Brandenburg from 1640 to 1688, commonly called the Great Elector. He was the son of

the Elector George William, and was born February 16, 1620. On his accession he found an empty exchequer, the towns and cities depopulated, and the whole electorate devastated by the ravages of the Swedish and Imperialist armies during the Thirty Years' War, which was not yet concluded. A portion of his inheritance had even been seized by the Swedes. His first acts were to regulate the finances, and to conclude a treaty of neutrality with Sweden, which left him at leisure to devote himself to the organization of his army and the re-peopling of the deserted towns and villages by means of immigration. By the Treaty of Westphalia, in 1648, he secured Further Pomerania (east of the Oder), and received the bishoprics of Halberstadt, Minden, and Kammin as lay principalities, together with the reversion of the See of Magdeburg. In the course of ten years he had, by the help of his generals, Derfflinger, Schomberg, and Kannenberg, created an army of 25,000 men, organized on the Swedish model. In 1656 he entered into an alliance with Charles X. of Sweden against Poland, and coöperated with him in the taking of Warsaw. In the following year he forsook the Swedish alliance, and placed himself on the side of Poland, which, in the Treaty of Wehlau, renounced its suzerainty over the Duchy of Prussia. The aggressions of Louis XIV., who sought to extend the French dominions to the Rhine, and made an onslaught upon Holland, alarmed the Elector, who induced the Emperor Leopold I., the King of Denmark, and the Elector of Hesse-Cassel to enter into a league against France (1672). The result was unfavorable to the cause of the German princes, and Frederick William was obliged to content himself with making highly disadvantageous terms in the following year. The war was soon renewed, and Brandenburg was again laid open to the incursions of the Swedes, who, at the instigation of Louis XIV., advanced upon Berlin, laying waste everything on their march. The Elector, who had taken up his winter quarters in Franconia, hurried across the Elbe at the head of his cavalry, and signally defeated the Swedes at Fehrbellin (June 18, 1675), driving them from his dominions. Deserted, however, by the other German princes, and his dominions overrun by the troops of Louis, he was obliged to agree to the Treaty of Saint-Germain, by which he restored all his conquests to the Swedes, in return for the withdrawal of the French army and an indemnity of 300,000 crowns. After this Frederick William devoted himself to the task of furthering the prosperity of his dominions. By his reception of 20,000 French Protestants, after the revocation of the Edict of Nantes (q.v.), and the encouragement which he afforded to the immigration of Hollanders and other foreigners, he augmented the population of his States, and introduced numerous industries among his subjects. He founded the University of Duisburg and the Royal Library at Berlin, and reorganized the universities of Frankfort-on-the-Oder and Königsberg. He opened canals, established a system of posts, and greatly enlarged and beautified Berlin. He left a well-filled exchequer and a highly organized army. Consult: Tuttle, *History of Prussia, 1134-1740* (Boston, 1884); Hiltl, *Der grosse Kurfürst und seine Zeit* (Bielefeld, 1893); Philippson, *Der grosse Kurfürst* (Berlin, 1897-1902).

FREDERICK WILLIAM (1771-1815). Duke of Brunswick. He entered the Prussian service in 1788, and was actively engaged with the army during the war with France, which began in 1792, and after the battle of Auerstädt, in which his father was mortally wounded, but in which the son took no part, was taken prisoner at Lübeck (November 7, 1806). On the death of his eldest brother he would have succeeded to the dukedom, had not Napoleon put a veto on his accession. Frederick William joined Austria in the war against Napoleon in 1809. He raised a corps of volunteers in Bohemia, invaded Saxony, and, reinforced by an Austrian detachment, took Dresden and Leipzig. The defeat of the Austrians at Wagram left him isolated in Central Germany, and he determined to make for the North Sea and England. With 1500 men he set out from Leipzig (July 20th), passed through Brunswick, where he overthrew 4000 Westphalians under Reubel, crossed the Weser, reached Elsfleth, seized all the available shipping and sailed for England (August 7th). He was received with enthusiasm, entered the English service with his men, and afterwards took part in the War of the Peninsula, where he served with distinction till his return to his own dominions in 1813. His attempts to maintain an excessive army and to force reforms upon his people made him very unpopular. He joined the allied army with a force of 8000 men after the return of Napoleon from Elba, and fell while leading his men at Quatre-Bras, on June 16, 1815.

FREDERICK WILLIAM I. (1688-1740). King of Prussia from 1713 to 1740. He was the son of Frederick I., and was born August 15, 1688. He was in almost every particular the opposite of his father—simple and almost penurious in his habits, attending to business, passionately fond of military exercises, averse to culture, fond of the society of the low and illiterate, and carrying to the utmost his ideas of arbitrary power and the divine right of kings. The public events of his reign were of little importance. From Charles XII. of Sweden he wrested a great part of Hither Pomerania, including Stettin, playing a rôle which he himself confessed was not fit for an honest man. He died at Potsdam, May 31, 1740. As the founder of an administrative system, of which he himself worked out the minutest details, Frederick William stands prominent among the monarchs of his century. By his economy and reforms in the finances he was able to indulge his taste for the organization of military forces. His childish love for tall soldiers induced him to resort to the most flagrant outrages, both at home and abroad, for kidnapping tall men and forcing them into his service. The result of this system, which was greatly moderated toward the end of his reign, was that he left at his death a well-drilled army of 80,000 soldiers. What was of more consequence to his son and successor was that his exchequer contained 9,000,000 thalers, and that his kingdom had attained an area of more than 45,000 square miles and a population of upward of 2,200,000. Consult: Tuttle, *History of Prussia, 1134-1740* (Boston, 1884); Förster, *Geschichte Friedrich Wilhelms I.* (Potsdam, 1835); Carlyle, *History of Friedrich II., called Frederick the Great* (London, 1858-65).

FREDERICK WILLIAM II. (1744-97). King of Prussia from 1786 to 1797. He was the son of Prince Augustus William of Prussia, the brother of Frederick the Great, and was born September 25, 1744. During his reign Prussia declined, owing to his indolence and lack of political sagacity. He gave himself up to sensuality and to the mystic vagaries of the Rosicrucians. He contracted four marriages, besides making no secret of his relations with the Countess Lichtenau. His good nature led him to abrogate taxes which the country could hardly spare; a futile expedition into Holland, in support of the Stadtholders, cost him 6,000,000 thalers; and his efforts, in conjunction with Austria, to uphold royalty in France, resulted, after a war lasting from 1792 to 1795, in the cession to France, by the Treaty of Basel, of the Prussian territories west of the Rhine. Frederick William II. shared in the second and third partitions of Poland (1793, 1795), by which Prussia received large accessions of territory. Consult Treitschke, *Deutsche Geschichte im XIXten Jahrhundert* (Leipzig, 1878-95).

FREDERICK WILLIAM III. (1770-1840). King of Prussia from 1797 to 1840. He was the son of Frederick William II., and was born August 3, 1770, at Potsdam. On his accession in 1797 he dismissed the favorites of the preceding reign, and entered upon a tour of inspection through the numerous provinces of his kingdom, for the purpose of investigating their condition. But though Frederick William was well intentioned, he lacked the force of will to cope with the difficulties of his position. By his efforts to maintain an attitude of neutrality in the great European struggle following upon the French Revolution, he awakened the distrust of the powers of Europe, and disappointed the petty German princes, who had looked upon Prussia as their protector against French aggression. In the reconstitution of the German Empire after the Peace of Lunéville (1801), Prussia acquired the sees of Hildesheim, Paderborn, and Münster, as a compensation for her territories west of the Rhine wrested from her by France. The repeated and systematic insults of Napoleon, who despised Frederick William while he professed to treat him as a friend, roused the spirit of the nation, and the King saw himself obliged to agree to a convention with Russia, the real object of which was to drive Napoleon out of Germany. But when Napoleon marched against Austria in 1805, Frederick William remained inactive. After the battle of Austerlitz (December, 1805), he even entered into a convention with Napoleon, by which Prussia gave up Anspach, Bayreuth, Cleves, and Neuchâtel, and received more than their equivalent in Hanover, wrested by Napoleon from the English dynasty. The affronts of Napoleon were redoubled after this fresh proof of Frederick William's indecision. The Prussian nation, headed by the Queen, the beautiful Louisa of Mecklenburg-Strelitz, now called loudly for war, and the King yielded. The Prussian Army was annihilated in the battles of Jena and Auerstädt, fought on the same day (October 14, 1806), and the French overran the kingdom. The Russian armies advanced to the aid of Prussia. The indecisive battle between the Allies and the French at Eylau (February 7, 8, 1807) was followed by the victory of Napoleon over the Russians at Friedland (June 14), which left Prussia at the

mercy of the conqueror. In the Treaty of Tilsit, July 9, 1807, Prussia was almost dismembered, being forced to give up her possessions west of the Elbe and the Polish dominions acquired in 1793 and 1795. During the next few years Prussia remained almost effaced as a European power, and Napoleon seized every opportunity of humbling Frederick William. But during this period of humiliation the King and his people were quietly undertaking the task of regeneration. The utmost energy was displayed in every branch of the administration. Frederick William's great Minister, Stein, emancipated the serfs and inaugurated local self-government in the towns. Scharnhorst and Gneisenau reorganized the army, training in secret three times as many men as were allowed by treaty with Napoleon. The disastrous termination of Napoleon's Russian campaign was the turning-point in the fortunes of Prussia. At the beginning of 1813 the German people rose in arms against France, Frederick William entering into an alliance with Russia. Napoleon was victorious at Lützen and Bautzen, May, 1813. Austria now took up arms against France, and the battle of Leipzig, October, 1813, achieved the liberation of Germany. Prussia joined in the invasion of France, and her armies entered Paris. The Congress of Vienna restored to Prussia a great part of her former possessions, and among her acquisitions were half of the Kingdom of Saxony and large territories in the Rhineland. The part played by Blücher at Waterloo determined Prussia's rank among the great military powers of Europe. The Prussian people, however, were doomed to disappointment in the erection of a new era of liberal government. In 1815 Frederick William joined Czar Alexander I. and the Emperor Francis of Austria in the formation of the Holy Alliance, the chief object of which soon showed itself to be the maintenance of absolutism. The Prussian King played into the hands of Metternich, who directed the policy of the Holy Alliance. Frederick William III., however, did much for the material advancement of his realm. In his reign the Zollverein, or customs union, was established, which at the time of his death included the bulk of the German States, exclusive of Austria. He died June 7, 1840. Consult: Treitschke, *Deutsche Geschichte im XIXten Jahrhundert* (Leipzig, 1886-95), especially vol. i. See GERMANY; PRUSSIA; GNEISENAU; STEIN; SCHARNHORST.

FREDERICK WILLIAM IV. (1795-1861). King of Prussia from 1840 to 1861. He was the son of Frederick William III., and was born October 15, 1795. He received a careful education, and was fond of the society of learned men. He ascended the throne June 7, 1840. He exhibited much of his father's vacillation and instability of purpose; and although he began his reign by granting minor reforms and promising radical changes of a liberal character, he always, on one plea or another, evaded the fulfillment of these pledges. He had high but vague ideas of 'the Christian State,' and showed through life a strong tendency to mystic pietism. Equally vague was his dream of a Germany united under a 'college of kings' ruling by divine right. A step in the direction of popular government was taken in 1847 by the convocation of the so-called 'United Diet,' whose activity, however, was to be

merely that of an advisory body. The February Revolution in France in 1848 was followed by an outbreak in Prussia which shook the throne of the Hohenzollern to its foundations. On March 18 the people of Berlin rose in arms. To save his crown, the King yielded to the demand for constitutional reform. In May a national Constituent Assembly met, at the same time that the Frankfort Parliament assembled to reorganize the political system of Germany. On February 26, 1849, the new Prussian Chambers met, but the constitutional régime thus inaugurated was granted merely as the King's free gift, to be modified at his pleasure. On March 28, 1849, the Frankfort Parliament offered the Imperial crown of Germany to Frederick William, but he declined it. (See GERMANY.) In the meanwhile the King had been forced, in 1848, by the clamor of his subjects, to take up arms in support of the people of Schleswig-Holstein in their revolt against Denmark, but Prussia soon abandoned the cause of the duchies. After the complete cessation of the revolutionary movement in Germany, the reactionary régime was in full sway. The 'pietists' regained their former influence at Court, and the freedom of the press and of religious and political opinion was strictly circumscribed. In 1857 Frederick William was seized with intermittent attacks of insanity, and in 1858 he resigned the management of public affairs to his brother and heir, Prince William, who acted as regent of the kingdom till his accession, on the death of Frederick William, which occurred January 2, 1861. Consult Biedermann, *Dreissig Jahre deutscher Geschichte* (Breslau, 1896).

FREDERICK WILLIAM I. (1802-75). Elector of Hesse. He was educated at Marburg and Leipzig, and became co-regent in 1831, and Elector in 1847. He sided with Austria during the War of 1866, and his refusal to accede to the terms of Prussia led to the invasion of his territory. In consequence of his obstinate refusal to treat with the Prussian Government, he was arrested and conveyed to the fortress of Stettin, and his territories were annexed by Prussia.

FREDERICK, CHRISTIAN AUGUST (1829-80). Duke of Schleswig-Holstein-Sonderburg-Augustenburg, and claimant to the duchies of Schleswig and Holstein. He was born on the island of Alsen, and was educated at Bonn. After the unsuccessful revolt of Schleswig-Holstein against Danish rule, the ducal family was banished. Frederick enjoyed great popularity with the people, however, and when, after the war of 1864, the rule of Denmark in the duchies was terminated, he triumphantly entered Kiel, where he was eagerly welcomed. Numerous political complications now arose which prevented the formal reinstatement of the dynasty. By the terms of the Treaty of Vienna (October, 1864), the duchies had been relinquished to Prussia and Austria, to be disposed of by them. Prussia, however, was not inclined to permit the creation of a new German State, and imposed conditions upon Frederick which made it impossible for him to assume the government. After the Peace of Prague, which terminated the Austro-Prussian War of 1866, the lands were finally absorbed into the Kingdom of Prussia. Frederick subsequently served on the staff of the Crown Prince, Frederick William of Prussia, during the Franco-German War of 1870-71. His

daughter, Augusta Victoria, became the wife of Emperor William II. of Germany.

FREDERICKSBURG. The county-seat of Gillespie County, Texas, 80 miles west of Austin and 25 miles north of Comfort, the shipping point, on the San Antonio and Aransas Pass Railroad (Map: Texas, E 4). Stock-raising and farming are the leading industries, and there are some manufactures. A German colony founded Fredericksburg in 1846. Population, about 1800.

FREDERICKSBURG. A city in Spottsylvania County, Va., 60 miles north of Richmond; on the Rappahannock River at the head of tide-water, and on the Potomac, Fredericksburg and Piedmont and the Richmond, Fredericksburg and Potomac railroads (Map: Virginia, G 3). The city lies in a valley inclosed by high hills, and has a public library, several bridges across the river, a beautiful park, and the famous Stonewall (Confederate) and National cemeteries, the latter having 15,300 graves. It is the seat of Fredericksburg College (Presbyterian) opened in 1893. A dam above the city, 900 feet long and 18 feet high, affords valuable water-power; and there are manufactures of flour, silk and woolen goods, iron, shoes, shirts, pickles, cigars, sumac, carriages, wheels, hubs, spokes, tanned leather, and excelsior. Fredericksburg is governed under a revised charter of 1871 which provides for a mayor, elected biennially, and a unicameral council. The city owns and operates its water-works and gas and electric-light plants. Population, in 1890, 4528; in 1900, 5068. On the site of Fredericksburg, Captain John Smith fought a skirmish with the Rappahannock Indians in 1608. The town was named in 1727 in honor of the Prince of Wales, and was incorporated in 1782. It was the home of Gen. Hugh Mercer, killed in the battle of Princeton, and of the Revolutionary officers George Weedon, William Woodford, and Gustavus B. Wallace. An imposing monument has been erected in honor of Washington's mother, who died here in 1789. During the Civil War Fredericksburg changed hands several times, and was the scene of several battles. See FREDERICKSBURG, BATTLE OF; and CHANCELLORSVILLE, BATTLE OF.

FREDERICKSBURG, BATTLE OF. An important battle of the Civil War in America, fought on December 13, 1862, at Fredericksburg, Va., between the Federal Army of the Potomac, numbering about 116,000, under General Burnside, and the Confederate Army of Northern Virginia, numbering about 78,000, under General Lee. On November 15th Burnside, who, on November 7th, seven weeks after the battle of Antietam, had superseded McClellan as commander of the Army of the Potomac, then stationed near Warrenton, Va., started down the left bank of the Rappahannock with the intention of crossing at Fredericksburg, where he expected General Halleck to have pontoon bridges in readiness, and of marching thence on Richmond. The Right Grand Division under Sumner arrived at Falmouth, near Fredericksburg, on the 17th, but could not effect a crossing, owing to the absence of bridges, and was accordingly stationed on Stafford Heights, opposite Fredericksburg. Hooker and Franklin, commanding the Centre and Left Grand Divisions, arrived soon afterwards. Meanwhile, Longstreet, acting under orders from Lee, hastened to Fredericksburg by forced marches,

reached there on the 21st, and immediately took up a position on the hills back of the town, which he proceeded with great energy to fortify. Jackson's corps arrived from the Shenandoah Valley about November 30th, and Jackson assumed command of the right of the Confederate army, the whole Confederate line ultimately extending for more than six miles, though it was broken in several places by streams and ravines. Burnside was not ready to cross the Rappahannock until December 11th, and on that day and the 12th the Right and Left Grand Divisions succeeded in passing to the other side, though the former, which crossed directly in front of Fredericksburg, met with considerable opposition from Confederate sharpshooters concealed in a cluster of brick and stone houses on the opposite bank. Hooker's Centre Grand Division crossed on the morning of the 13th, and was broken up to assist the Right and Left. After much hesitation and vacillation, Burnside, bewildered and confused by a task far transcending his ability, finally decided upon a plan of battle, in accordance with which, about noon on the 13th, Franklin, facing Jackson at the weakest point of the Confederate line—their extreme right—ordered Meade forward, with a single division, supported by two other divisions under Gibbon and Doubleday, to seize one of the opposing heights. Meade succeeded in penetrating the Confederate line, but along with Gibbon was soon forced back; so that this movement, which was the only one made by the Federal left, resulted in nothing but loss. Meanwhile, on the Federal right, Sumner six times attacked the almost impregnable Confederate works on Marye's Hill, but was each time driven back with terrific loss, the Federal troops, however, displaying in each attack wonderful steadiness and gallantry. The hill itself was heavily fortified. At its base, and parallel to the line of battle, ran a sunken road protected by a stone wall, behind which a large force of Confederates was stationed; and the approach was such as to expose an attacking force to an irresistible rain of shot and shell. At the end of the day's fighting, the Federals had lost in killed, wounded, and missing 12,653; the Confederates, 5377. Burnside contemplated repeating his attack on the following day, but was dissuaded by his officers, and withdrew unmolested to the left bank of the river on the night of the 15th. Consult: *Official Records*, vol. xxi.; Johnson and Buel (editors). *The Battles and Leaders of the Civil War*, vol. iii. (New York, 1887); Ropes. *The Story of the Civil War*, vol. ii. (New York, 1898); Palfrey. *The Antietam and Fredericksburg* (New York, 1882); Nicolay and Hay. *Abraham Lincoln: A History*, vol. vi. (New York, 1890); Allan. *The Army of Northern Virginia in 1862* (Boston, 1892); and Henderson. *Campaign of Fredericksburg, November-December, 1862* (London, 1886).

FREDERICQ, frâ'de-rêk. PAUL (1850—). A Flemish historian, born at Ghent. He was educated at Liège, and was appointed to the chair of history at Arlon, Liège, and Ghent, where he became a prominent leader of the national movement for the extension of the Flemish language, customs, and laws. His numerous works, which are distinguished by scholarly research and clearness of exposition, include: *De Nederlanden onder Keizer Karel*, vol. i. (1885); *Verzameling van*

stukken betreffende de pauselijke en bisschoppelijke Inquisitie in de Nederlanden (1889-96); and *Onze historische volksliederen van voor de zestiende eeuw* (1894).

FREDERICTON. A city and port of entry, the capital of York County and of New Brunswick, Canada, on the Saint John River, 60 miles north-northwest of Saint John (Map: New Brunswick, C 4). The river is navigable for large vessels to this point, 84 miles from its mouth in the Bay of Fundy; small steamers go 65 to 75 miles farther up. The city is the terminus of the Fredericton and the New Brunswick railroads. There is some manufacturing, but lumbering and trading are principally carried on. The city, built on a low point of land nearly surrounded by hills, is well laid out, and has elegant public buildings, among which are the residence of the Lieutenant-Governor, Parliament buildings, Government House, Legislative Library, exhibition building, hospital, custom-house, the New Brunswick University, the provincial normal school, a collegiate and other schools. Fredericton is the seat of an Anglican bishopric, and the cathedral is a handsome edifice. The United States has a consular agent here. Founded about 1740, the village was first called Saint Anne. After New Brunswick became a British possession, Sir Guy Carleton, the Governor, in 1785, laid out the principal streets to run parallel with the river, changed the name to Fredericton, and two years later it became the capital of the province. It was incorporated in 1849. Population, in 1891, 6502; in 1901, 7117.

FREDERIKSBERG, frân'ër-iks-bêrg. A western suburban municipality of Copenhagen, Denmark, with which it is connected by the wide Frederiksberg Allee, lined with pleasure gardens. It is a handsome residential place, with several attractive features in the beautiful park of Søndermarken, a zoölogical garden, the Ny-Carlsberg Glyptothek, an art museum, and the Frederiksberg Palace, constructed in Italian style, now used as a military college. The palace was built by Frederick IV., in the first half of the eighteenth century, and stands in a prominent hill park commanding a fine and extensive view. Population, in 1900, 76,237.

FREDERIKSBORG, frân'ër-iks-bôrg. A Danish castle, situated on a lake of the same name, on the island of Zealand, 22 miles north-northwest of Copenhagen. It was built in 1602-20, by Christian IV. of Denmark, on the site of an older building of Frederick II. It is in the Renaissance style, and since a fire in 1850 has been restored as a national historical museum, with handsome rooms, notably the knights' hall and the dining-hall. Its church was formerly the coronation place, and contains a king's oratory, with Passion paintings by Bloch.

FREDERIKSHALD, frân'ër-iks-hâld. A fortified seaport of Norway, beautifully situated on the Idefjord, at the mouth of the Tistedalselv, about 85 miles south-southeast of Christiania (Map: Norway, D 7). It has a Latin school. It exports a considerable amount of woodenware. The harbor is good, and is guarded by the fortress of Frederiksten, now of no importance, but never taken by an enemy, Charles XII. having fallen in an attempt to capture it in 1718. The town withstood a two years' siege

by the Swedes, 1658-60. Population, in 1891, 11,217; in 1900, 11,936.

FREDERIKSHAVN, frá'dër-iks-hä'v'n. A seaport town of Denmark, situated on the Cattedgat, 52 miles northeast of Aalborg (Map: Denmark, D 1). It has an excellent harbor, free from ice throughout the year. The chief imports are coal, iron, and cotton goods, while the exports consist of dairy products, beef, pork, and fish. Regular steamship lines run to the cities of Sweden, to England, and to Copenhagen. It is one of the youngest of Danish towns, having received municipal rights in 1818. Population, in 1901, 6478.

FREDERIKSTAD, frá'dër-ik-stüid. A seaport of Norway, situated at the mouth of the Glommen, 58 miles southeast of Christiania (Map: Norway, D 7). It is an important centre for the lumber trade with Germany, Holland, and France, the wood being rafted down the Glommen. It was founded in 1570, and was for a long time strongly fortified. Population, in 1891, 12,451; in 1900, 14,573.

FREDMAN, THE. A name sometimes used by the Swedish poet Karl Mikael Bellman (q.v.).

FREDONIA. A city and the county-seat of Wilson County, Kan., 91 miles east by south of Wichita; on Fall River, and on the Missouri Pacific, the Atchison, Topeka and Santa Fé, and the Saint Louis and San Francisco railroads (Map: Kansas, G 4). It is the centre of an agricultural and stock-raising district, and has a supply of natural gas. Its industrial establishments include flour-mills, brick-works, linseed-oil mill, etc. Population, in 1890, 1515; in 1900, 1650.

FREDONIA. A village in Chautauqua County, N. Y., 45 miles southwest of Buffalo; on the Dunkirk, Allegheny Valley and Pittsburg Railroad (Map: New York, A 3). It is the seat of a State normal school, and has the D. R. Barker Free Library. There is a fine village square, with two handsome fountains. At Central Park, midway between Fredonia and Dunkirk, the county fair is held. The village is in the Lake Erie grape region, and has extensive nurseries, canning establishments, and patent-medicine factories. The water-works and electric-light plant are owned and operated by the municipality. One of the oldest villages in western New York, Fredonia was settled in 1803 and incorporated in 1829. Natural gas was utilized for lighting the village as early as 1821. Population, in 1890, 3399; in 1900, 4127.

FREDRO, frá'dró, ALEXANDER, Count (1793-1878). A Polish playwright, born at Surochow, Galicia. For several years he served in the army, and at the end of that time (1814) he visited Paris and there studied the French theatre. Upon his return to Poland he produced eighteen comedies, which were played with success. He is praised for his depiction of comic types, and for the entirely national spirit of his work. His plays were collected and published in 1877, and again in 1880.—His son, JOHANN ALEXANDER (1829-91), born in Lemberg, was also a dramatic author. His plays had some success; but he was far from equaling his father. His works were published in 1881.

FREE BENCH (*francus bancus*). An ancient form of dower existing by custom, and not

by common law, in certain manors in England. The right of free bench was independent of endowment, and was a purely customary provision for the wife, who became entitled to it at once upon her husband's death, without waiting, as is still the case with ordinary dower, for its assignment by the heir. Coke says: "This right is called *francus bancus*, to distinguish it from other dowers, for that it cometh freely, without any act of the husband's or assignment of the heir" (Co. Litt. 94, b). The custom varied in different manors, the widow being entitled to the whole of her husband's lands in some, while in others she received one-half or one-third only. The right applied only to estates of inheritance held by the tenure of free and common socage, and was usually, if not always, limited to the period of widowhood and the good behavior of the wife (*dum sola et casta viverit*). See DOWER.

FREE CHURCH OF ENGLAND. See REFORMED EPISCOPAL CHURCH.

FREE CHURCH OF SCOTLAND. See PRESBYTERIANISM.

FREE CITIES (Ger. *Freistädte*). The name given to the three German cities of Hamburg, Bremen, and Lübeck, which are sovereign States and members of the German Empire. Since the middle of the fourteenth century the term 'free cities' has been used for certain German towns, but not always with the same meaning. The designation was applied: (1) To cities in the Rhine Valley (Cologne, Mainz, Worms, Speier, Strassburg, Basel) and elsewhere which had been under the control of bishops, but had become almost independent in the course of the thirteenth and fourteenth centuries. They enjoyed even greater freedom than the so-called 'Imperial' cities. All of these cities have become parts of the larger political divisions. (2) To the Hanse cities—Frankfort-on-the-Main, Hamburg, Bremen, and Lübeck. These cities were wealthy, and became centres of active popular life and of free institutions in the thirteenth, fourteenth, and fifteenth centuries. They maintained their freedom until the time of the Napoleonic wars. By the Congress of Vienna, in 1815, they were restored to their former rights as free cities. Hamburg, Lübeck, and Bremen still retain their privileges under the reconstituted German Empire; but Frankfort was annexed to Prussia in 1866. Consult: Arnold, *Verfassungsgeschichte der deutschen Freistädte* (Gotha, 1854); Hüllmann, *Städtewesen des Mittelalters* (Bonn, 1826-29).

FREE CONGREGATIONS (Ger. *freie Gemeinden*). An association of German rationalists. It originated in Saxony, in 1841, where the members were called 'Protestant Friends' and 'Friends of Light.' The immediate occasion was an attempt to discipline a Magdeburg preacher who had expressed heretical views. Early leaders in the movement were Leberecht Uhlich (q.v.) and Gustav Adolf Wislicenus (q.v.), both of whom were forced out of the Evangelical Church for expressing liberal views. In like manner, independent congregations arose in a number of places, and in 1847 a union was effected between them on the basis of a simple profession of faith in God. By this time their gatherings, held symbolically in the open air, had come to number more than two thousand, including delegates from England and America. In 1850 they

were united with the German Catholics (q.v.), and in the same year and the years immediately following some forty congregations were established in the United States, but had a short existence. After the revolutionary movements of the middle of the century several of the German governments undertook to suppress them, partly for political reasons. Many congregations were broken up. Those still in existence in 1859, about fifty in number, under Uhlich's leadership, formed a 'Union of Free Congregations in Germany,' upon a highly rationalistic basis. Inasmuch as the fullest individual liberty is allowed, the belief of members and congregations varies greatly. There has been a tendency toward radical free thought and some even deny the existence of a personal deity. The association is strongest in Berlin, Breslau, and Magdeburg. Its numbers and influence have gradually diminished. Consult: Uhlich, *Handbüchlein der freien Religion* (Magdeburg, 1859); Kampe, *Geschichte der religiösen Bewegung der neuern Zeit* (Leipzig, 1852-60); *Freidenker-Almanach* (Gotha, annually).

FREEDEN, frä'den, WILHELM IHNO ADOLF von (1822-94). A German mathematician and expert on navigation, born at Norden, Hanover, and educated at Bonn and Göttingen. He was director of the school of navigation at Elsfléth, Oldenburg, and later became established at Hamburg, where, in 1867, he founded the German Naval Observatory, which he conducted until 1875. The purpose of this institution is to promote and to facilitate maritime intercourse. It comprises the department of maritime meteorology; a bureau of nautical, meteorological, and magnetic instruments; the department of coast meteorology and signal service; and a bureau for testing chronometers. Freeden, who was a member of the Reichstag from 1871 to 1876, founded, with H. Tecklenborg-Bremen, the publication entitled *Hansa, Zeitschrift für Seewesen*, which he edited until 1891.

FREEDMEN'S BUREAU. A 'Bureau of Refugees, Freedmen, and Abandoned Lands,' established in the War Department of the United States by the statute of March 3, 1865. This act provided that the bureau was to be maintained through the war and for one year thereafter, and that it should have "the supervision and management of all abandoned lands, and the control of all subjects relating to refugees and freedmen," under "such rules and regulations as may be presented by the head of the bureau and approved by the President." Especially important was the provision authorizing the President to appropriate for the use of freedmen the confiscated and abandoned lands within the Southern States, not more than 40 acres for a period not longer than three years being assigned to each man thus aided. Provisions, fuel, and clothing were, moreover, to be distributed free of charge by the bureau to destitute freedmen and loyal refugees. The administration of the bureau was placed in the hands of a chief commissioner and his deputies, and in the actual application of the statute much was done with reference to labor, clothing, fuel, provisions, and schools for the beneficiaries of the plan. A second Freedmen's Bureau bill was passed by Congress, February 6, 1866, but was vetoed by President Johnson and was not passed over his veto. Later,

however, there was passed over the President's veto the act of July 16, 1866, which extended for two years the term of the bureau's statutory life, increased its powers, authorized the sale for educational purposes of Confederate public property, and gave to the bureau military jurisdiction over infringements of civil rights secured by the act. In June, 1868, another bill was passed, extending the term of the bureau for one year in unreconstructed States. The bureau's chief work ended on January 1, 1869, and its educational work was concluded a year and a half thereafter. More than \$15,000,000 was spent by the bureau, and, in addition to the general relief afforded, it aided appreciably in the movement for the higher education of the freedmen which resulted in the founding of such institutions as Atlanta University, Fisk University, and Howard University, the last being named after the chief figure in this work, the commissioner of the bureau, Gen. Oliver O. Howard (q.v.). Widely differing opinions have been, and are, held with regard to the methods used and the results attained by the bureau, some writers maintaining that its work was almost wholly beneficent, others that on the whole much more harm was done than good. The text of the first Freedmen's Bureau bill may be found in 13 *Statutes at Large* (38th Congress); that of the second in 13 *Statutes at Large* (39th Congress). For an account of the bureau's work, consult General Howard's report for 1869, published among the executive documents of the House of Representatives, Forty-first Congress, second session. Also consult "The Freedmen's Bureau," in *Atlantic Monthly*, vol. lxxvii. (Boston, 1901). See RECONSTRUCTION.

FREEDOM OF THE CITY. The custom, prevalent both in American and European cities, of conferring on a distinguished visitor the privileges connected with municipal citizenship. The names of such honorary citizens or burgesses are entered upon the register of municipal electors; but they are not entitled, when non-residents, or not engaged in business in the particular city and town, to exercise the municipal franchise or to be admitted to membership in the governing bodies. The practice of conferring the freedom of the city, which at present amounts to little more than an expression of esteem on the part of the public magistrates, may be traced back to mediæval times, when the principle of freedom of domicile was by no means universally recognized, and cities partook almost entirely of the nature of private corporations, admission into which was hampered by many restrictions. The most usual way of obtaining the privileges of citizenship at that time was by a long term of apprenticeship (seven years as a rule) to one of the recognized guilds, followed by an examination in the principles of the craft, and, where the candidate was successful, enrollment in the ranks of master workmen. In view of so cumbersome a process, the presentation of the freedom of the city by a special vote of the magistrates was, in fact, a substantial favor, and was granted only in cases where great wealth or renowned citizenship made a man a desirable accession to the list of burghers. See GUILDS.

FREE FUGUE. See FUGUE.

FREE GIFT. See BENEVOLENCE.

FREEHOLD. A town and the county-seat of Monmouth County, N. J., 25 miles east of Tren-

ton; on the Pennsylvania and the Central of New Jersey railroads (Map: New Jersey, D 3). It has a park in which is a fine granite monument 100 feet high, commemorating the battle of Monmouth (q.v.). The town is commercially important as a distributing centre for a farming district, and manufactures shirts and underwear, foundry and machine-shop products, rasps, bicycles, etc. Freehold was settled about 1735, when county courts first began to be held here, and for many years was known as Monmouth Court House. It was incorporated in 1869. Population, in 1890, 2932; in 1900, 2934.

FREEHOLD (Lat. *liberum tenementum*, free holding or tenement). In the classification of estates in land, any estate of inheritance or for life, held by a free tenure. It is distinguished from the copyhold (q.v.), and from the leasehold (q.v.). As thus employed it is a mere term of classification, but in its origin it was coextensive in meaning with the term fee, as signifying lands held of some lord by feudal tenure. (See **FEE**; **TENURE**.) The original freehold or fee was the life estate, and the term freehold has always been employed by law writers from Littleton down in a special and technical sense, as signifying an estate for life. But its more common use, especially in American law, is as above indicated. Under the feudal system, a free holding or freehold was such a tenement as a free vassal might properly hold. The tenure might be military or non-military, and the estate might be corporeal or incorporeal, but the holding must be for life at least, and not for a definite term of years, nor, as in the case of copyhold, at the will of the lord of whom the land was held. For a description of the various forms of freehold, see **FEE SIMPLE**; **FEE TAIL**; **LIFE ESTATE**. See also **ESTATE**; **FEUDALISM**.

FREE LANCE (Ger. *freier Landsknecht*, free land-trooper, in distinction from the Swiss mountaineers, but confused with *Lanzknecht*, lance-trooper). In the later Middle Ages, and early modern times, one of the roving companies of knights and men-at-arms who wandered from State to State, selling their services to any lord who was willing to purchase their aid. They played their most prominent part in Italy, where they were known as *condottieri* (q.v.). See **BRABANÇONS**.

FREE/LAND. A borough in Luzerne County, Pa., 40 miles south of Wilkesbarre; on the Lehigh Valley Railroad (Map: Pennsylvania, F 2). It is in a coal-mining and agricultural region, and has a foundry and machine-shops, lumber-mills, etc. Population, in 1890, 1730; in 1900, 5254.

FREE LIBRARIES. See **LIBRARIES**.

FREEMAN, MRS. The name assumed in jest by Sarah Jennings, wife of John Churchill, Duke of Marlborough, during her friendship and correspondence with Queen Anne. The name was adopted shortly after the beginning of the acquaintance in 1683. Queen Anne adopted that of Mrs. Morley.

FREEMAN, ALICE ELVIRA. See **PALMER, MRS. ALICE FREEMAN**.

FREEMAN, EDWARD AUGUSTUS (1823-92). An English historian, man of letters, and lecturer. He was born at Mitchley Abbey, Harborne, Vol. VIII. — 15.

Staffordshire, August 2, 1823, and at an early age was left an orphan. Under the care of his paternal grandmother he received education in various private schools, and after a course of private tuition, received a scholarship at Trinity College, Oxford, in 1841. In 1845 he graduated, and the same year was elected fellow of his college. In 1847 he married Miss Eleanor Gutch, daughter of his former private tutor. The following year with an accession to his private fortune he retired to Dursley, Gloucestershire, and applied himself to a life of historical study, research, and literature. With a special predilection for ecclesiastical architecture, in 1849 he published *A History of Architecture*. He contributed articles and reviews to *The Guardian*, *The Saturday Review*, and other periodicals, and also published pamphlets, all noted for their scholarship, accuracy, and correction of popular errors, which kept his name prominently before the reading public. In 1857 and 1858 he was appointed examiner in the School of Law and Modern History at Oxford, a position he again held in 1863, 1864, and in 1873. In 1860 he had removed to Somerleaze, near Wells, Somerset, where for some years he acted as county magistrate, and with political aspirations as a Gladstonian Liberal, in 1868 unsuccessfully stood as member of Parliament for Mid-Somerset. In 1863 appeared the first volume of his *History of Federal Government from the Foundation of the Achaian League to the Disruption of the United States* (a work that he left unfinished); in 1867 was published the first volume of his *History of the Norman Conquest* (6 vols., 1867-79), which established his position among English historians. He was created D.C.L. of Oxford in 1870; in 1874 received the honorary degree of LL.D. from Cambridge; and in 1880 was elected honorary fellow of his college at Oxford. For the better elucidation of his subjects he traveled extensively, visiting the places connected with the histories he was writing. In the winter of 1881-82 he visited the United States on a lecturing tour, which resulted in the publication of *Introduction to American Institutional History* (1882), *Lectures to American Audiences* (1882), and *Some Impressions of the United States* (1883). He succeeded Bishop Stubbs of Chester as regius professor of modern history at Oxford in 1884, and the same year was created honorary LL.D. of Edinburgh University. From 1886 to 1890, failing health impelled him to spend the winters of each year in Sicily, where he wrote his *History of Sicily* (4 vols., 1891-94). While traveling in Spain he died of smallpox at Alicante, March 16, 1892. Freeman was the leader of the Teutonic School of English history, and a voluminous writer. His principal work, *The History of the Norman Conquest*, in impartial, exhaustive treatment, and unimpeachable accuracy, is one of the greatest monuments of historical research, but prolixity and didacticism mar its otherwise lucid and vigorous style. It is as a political historian that he is best known. Among his writings not already mentioned are: *History and Conquest of the Saracens* (1856); *Comparative Politics* (1873-96); *Growth of the English Constitution* (1876); *The Ottoman Power in Europe* (1877); *Historical Geography of Europe* (1881); *English Towns and Districts* (1883); and *The Reign of William Rufus* (2 vols., 1882). Consult Stephen, *Life and Letters*

of *Edward Augustus Freeman* (2 vols., London, 1895).

FREEMAN, JAMES (1759-1835). An American Unitarian clergyman. He was born in Charlestown, Mass., graduated at Harvard, and in 1782 became a reader in King's Chapel, Boston. Subsequently he became a Unitarian, and induced the people of his Church to alter their prayer-book in accordance with his views. In 1787 he was ordained by his own congregation, since the Bishop refused to ordain him, and remained rector of King's Chapel (now the Stone Chapel) thirty-nine years. He was a scholarly and philanthropic man, and was one of the founders of the Massachusetts Historical Society. His was the first Unitarian church in this country. A volume of his *Sermons and Charges* was published in 1832.

FREEMAN, JAMES EDWARD (1808-84). An American painter. He was born in Nova Scotia, removed with his parents to the State of New York, and became a student in the National Academy of Design. He was made academicien in 1833, and after 1836 lived in Rome. His pictures are genre works and portraits. Noteworthy among his paintings are: "The Mother and Child" (1868); "Lucchese Peasants on the Sands of the Serchio" (1883); "The Beggars"; "Young Italy." They are carefully finished and well colored.

FREEMAN, JAMES MIDWINTER (1827-1900). An American clergyman and writer. He was born in New York City and was educated at Wesleyan University and at Mount Union College (Ohio). He entered the Methodist ministry, and in 1872 became assistant editor of various Sunday-school and tract publications of the Methodist Episcopal Church. Under the pseudonym of "Robin Ranger," Freeman wrote several books for children. His other works include: *Use of Illustration in Sunday School Teaching* (1867); *Handbook of Bible Manners and Customs* (1874); and *A Short History of the English Bible* (1879).

FREEMAN, NATHANIEL (1741-1827). An American physician and jurist, born at Dennis (Barnstable County), Mass. He settled at Sandwich (also in Barnstable County) in 1763. He studied both medicine and law, was active as a soldier during the Revolutionary period, commanded a militia regiment in the Rhode Island expedition, and from 1781 to 1791 was brigadier-general of militia. From 1795 to 1799 he was a member of Congress. He was also in the State Legislature of Massachusetts, and long a judge of probate and of the Court of Common Pleas. His reputation as a medical practitioner and as an orator was considerable. He published *A Charge to the Grand Jury at Barnstable* (1802).

FREEMAN, SUSANNA. See CENTLIVRE, SUSANNA.

FREEMAN AND FREEDMAN. In the most general acceptance of these terms, the first implies one who has inherited the full privileges and immunities of citizenship; the second, one who has been delivered from the restraints of bondage, but who, usually, is not placed in a position of full social or even political equality with him who was born free. With the Romans the equivalent for freeman (*liber homo*) comprehended all classes of those who were not slaves; but the distinction was preserved by the

application of the term *ingenuus* to him who was born free, and of *libertinus* to him who, being born in servitude, was emancipated. As the organization of Roman society survived the convulsions of the Middle Ages to a far greater extent in the towns than in the rural districts, where the institutions of feudality almost entirely superseded it, it is in the borough and other municipal corporations of Continental Europe that *freemen* still were found comprising persons inheriting or acquiring by adoption, purchase, or apprenticeship the rights of citizenship. The idea of a freeman was by no means peculiar to the Roman or Romanized population of Europe; on the contrary, it belonged to the constitution of society in all the Indo-Germanic nations. Among those branches of them commonly known as Teutonic, it was generally based on the possession of some portion of the soil. Thus in Anglo-Saxon England "the freeman was strictly the freeholder, and the exercise of his full rights as a free member of the community to which he belonged became inseparable from the possession of his holding in it." Consult Green, *The Making of England* (London, 1882). See ANGLO-SAXONS; CITIZEN; SLAVERY.

FREEMASONRY. A modern name of popular usage designating the principles of the Order of Freemasons. Formerly the word *Masonry* alone was employed, and is still used in the writings, history, and ritual of the craft. The term Freemasonry seems to have arisen from the fact that only *free* men were eligible to the Order, and that they were required to be elected with practical unanimity. The members then denoted themselves 'Free and Accepted Masons'; but the public curtailed this to Freemasons, and the order to Freemasonry. See MASONS, FREE.

FREE METHODISTS. See METHODISM.

FREE PORT (Ital. *porto franco*). A harbor where the ships of all nations may enter on paying a moderate and uniform toll, and load and unload. Free ports form depots where goods are stored at first without paying duty; these goods may then be either reshipped for export on paying a mere transit-duty, or they may pay the usual full customs of the country, and be admitted for home consumption. Free ports thus facilitate transit trade, and form, as it were, a foreign district within a State. See WAREHOUSING SYSTEM.

FREEPORT. A city and the county-seat of Stephenson County, Ill., 114 miles west by north of Chicago; on the Pecatonica River, and on the Chicago and Northwestern, the Illinois Central, and the Chicago, Milwaukee and Saint Paul railroads (Map: Illinois, C 1). It has a public library. There are railroad shops, and manufactures of organs, wagons, buggies, bicycles, wind-mills, novelties, and coffee-mills. Freeport was settled in 1835 and chartered in 1885. The government is administered by a mayor, elected every two years, and a unicameral council, Population, in 1890, 10,189; in 1900, 13,258. Here in 1858 occurred the debate between Lincoln and Douglas in which Douglas enunciated his famous 'Freeport heresy' or 'doctrine,' which was to the effect that, in spite of the Dred Scott case (q.v.), any Territory might virtually exclude the slave system by passing 'unfriendly' police laws incompatible with its existence. This doctrine alienated many of Douglas's former supporters, and greatly

weakened him in the Presidential campaign of 1860.

FREEPORT, Sir ANDREW. One of the members of the fictitious 'Spectator Club,' in Addison's *Spectator*.

FREEB, PAUL CASPAR (1862—). An American chemist, born in Chicago, Ill. He graduated at Rush Medical College in 1882, and studied in Germany, taking his Ph.D. degree at the University of Munich in 1887. In 1889 he became professor of general chemistry at the University of Michigan. Besides contributions to scientific publications, he is the author of *A General Inorganic Descriptive Chemistry* (1896).

FREE SCHOOLS. See COMMON SCHOOLS.

FREE SHIP. See ARMED NEUTRALITY, THE; DECLARATION OF PARIS.

FREE'SIA. A genus of bulbous plants of the natural order Iridaceæ, natives of the Cape of Good Hope, which during the closing quarter of the nineteenth century became widely popular as greenhouse and window-garden plants for winter blooming. The leaves are long and grass-like; the long scape, bent at an angle, bears at the top five or six pale-yellowish or white erect tubular flowers of exquisite fragrance. Perhaps the freesia is the easiest and most satisfactory bulbous plant to grow, since it requires even less attention as to soil and watering than the hyacinth, and unless kept too dry, or watered too heavily, will produce flowers without forcing in from six to eight weeks. The principal producing centres of freesias are the Channel Islands, California, and Bermuda, where the finest bulbs are said to grow. For illustration, see Colored Plate of IRIS.

FREE-SOIL PARTY, THE. The name of a political party in the United States, which was formed in 1848, and became merged in the Republican Party in 1856. The activity of the Abolitionists (q.v.) throughout the decade of the thirties, the energetic though indirect championing of the equal rights of all men by conservative leaders, such as John Quincy Adams, and the controversy over the extension of slavery in connection with the admission of Texas, brought the question of the further extension or the restriction of slavery once more into the foreground in 1844, although both of the existing parties, Democrats and Whigs, virtually refused to recognize the existence of any such question. Within the Northern wing of each party there arose, therefore, groups of workers, such as that led by S. P. Chase in Ohio, who aimed to commit their party to the principle of opposition to the further extension of slavery in the national Territories. The issue was forced by the introduction, in the House of Representatives, of the so-called 'Wilmot Proviso' (q.v.) in 1846 by David Wilmot, a Democratic member from Pennsylvania, as an amendment to a bill in Congress making an appropriation to negotiate peace with Mexico. The proviso passed the House, but failed in the Senate. Particularly in Massachusetts was a vigorous effort made to make the Whig Party a free-soil party, and the bitter contest between the 'Conscience' Whigs and the 'Cotton' Whigs enforced upon the former the fact that for them there was no place within their old party, and that in order to establish their principle, they must found a party whose dominant purpose

should be opposition to slavery extension. The necessity for this was still further emphasized by the refusal of both national conventions of 1848 to indorse the principle of the Wilmot Proviso; and so in August of 1848 there met at Buffalo the first national convention which stood for this principle, and which comprised in its membership the 'Barnburner' Democrats of New York, who had bolted their national convention, members of the former Liberty Party (q.v.) under the leadership of Chase, and the 'Conscience' Whigs of Massachusetts, led by Charles Francis Adams and Charles Sumner. By this convention Van Buren and Adams were named as the national ticket, and resolutions were adopted which concluded: "That we inscribe on our banner 'Free Soil, Free Speech, Free Labor, and Free Men,' and under it will fight on and fight ever, until a triumphant victory shall reward our exertions." Although the ticket received no electoral vote, and only 291,263 popular votes (sufficient to turn the scale in favor of Zachary Taylor as against Lewis Cass), the party secured such local advantages that it was able to send Chase to the Senate in 1849, and Sumner in 1851. On the other hand, the alliance with the 'Barnburners' was only temporary, and in the election of 1852 the Free-Soil candidate, John P. Hale of New Hampshire, received only 157,685 votes. In that year many Northerners were reconciled to their original parties by the 'finality' planks, and by the hope of thus preventing any further discussion of slavery extension. When this hope was proved to be ill-founded, by the Kansas-Nebraska struggle, old party lines were broken, and the principles of the Free-Soil Party were in large part adopted by the newly formed Republican Party. See LIBERTY PARTY; REPUBLICAN PARTY.

FREE SONS OF ISRAEL, INDEPENDENT ORDER OF. A Jewish fraternal and benevolent society, with headquarters in New York City, founded on January 10, 1849. It has three grand lodges and 103 subordinate lodges, distributed throughout the United States, and had in 1902 a total membership of some 11,000. At the same time it had a reserve fund of over \$860,000, and had since its organization paid to widows and other beneficiaries \$3,300,000, and by lodges for benefits \$3,150,000.

FREESTONE. A stone that is easily quarried and shaped. Sandstones and limestones possess these qualities in the highest degree, being found in stratified beds which are usually divided into blocks of convenient size by horizontal and vertical planes. When fresh from the quarries they are generally soft and can be sawn or chiseled without difficulty. The Berea sandstone and Bedford limestone are good examples of freestone.

FREETHINKER. One who forms his theological or religious beliefs by the exercise of his own reason, instead of accepting them on authority. The term came into common use early in the eighteenth century, after the publication of Anthony Collins's *Discourse of Freethinking, occasioned by the Rise and Growth of a Sect called Freethinkers* (London, 1713), and was applied particularly to the English Deists. (See DEISM.) It has been used to designate rationalists, infidels, or skeptics.

FREETOWN. The capital of the British West African colony of Sierra Leone, situated

on the left bank of the Sierra Leone River, about five miles from the coast and 33 miles by rail from Songotown (Map: Africa, C 4). It lies in a low marshy spot and is separated from the interior by a mountain chain. It is the headquarters of the British forces in West Africa, and a second-class Imperial coaling station, and has a fine harbor protected by several batteries of heavy modern ordnance. There are a cathedral, a Governor's palace, a Supreme Court, and a mission house. There is a considerable export trade in india-rubber, palm oil, gums, nuts, and hides; gold and silver ornaments, and filigree work, are skillfully made by native experts. Population, in 1901, 30,033, including only about 200 Europeans.

FREE TRADE. As first used in English literature, the term 'free trade' designated trade open to all merchants, as distinguished from that monopolized by chartered trading companies. In course of time restrictions other than monopolies attracted attention, and the term was extended to cover trade unhampered by any sort of governmental regulation. It was even used by some writers in a sense practically synonymous with 'free competition.' During the eighteenth century customs duties became the favorite mode of trade restriction, and 'free trade' became trade carried on in defiance of customs regulations. The free-traders of this period were the class we now call smugglers. At present 'free trade' designates trade that is either entirely unrestricted or restricted only in ways that afford no protection (q.v.) to home industries. The former exists only in the imagination of economists, as no government has ever attempted to put it in practice. The latter, on the other hand, is actually realized in the policy of the United Kingdom. It is to it, rather than to absolutely free trade, that the present article refers.

Although advocates of freedom of trade were not lacking in Europe before the eighteenth century (e.g. De la Croix, in France, in 1623, and Nicholas Barbon, in England, in 1696), it was not until then that any considerable number of persons of influence declared themselves for such a policy. The honor of having led in the crusade against the restrictions of the mercantile system, which was begun about 1750, belongs to the group of French writers called Physiocrats (q.v.). By them free trade was for the first time presented as an essential principle of a well-rounded system of economics. Moreover, it was through a Physiocrat (Gournay) that currency was given to the since famous phrase, "*Laissez-faire, laissez-passer*" (Let people do as they please; let goods pass freely); and through another (Turgot, the Finance Minister of Louis XVI. in 1774) that an effort was made to put in practice the leading doctrine of the school by establishing free trade in grain throughout France.

At the same time that the Physiocrats were formulating their doctrine in France (1752-63), Adam Smith was proving to his students at the University of Glasgow that the restrictions on trade, which were universal in Europe at this period, were obstacles rather than aids to a country's industrial progress, and that freedom of trade was the policy best adapted to promote the general interest. Subsequently, while sojourning in Paris, Adam Smith made the acquaintance of some of the leaders of the Physiocratic school,

and was doubtless confirmed in his opinions by what he learned of their views.

The distinguishing merit of his famous *Wealth of Nations*, regarded as a contribution to the literature of free trade, was that it showed exhaustively the evil results due to each kind of trade restriction advocated by the Mercantilists. To this part of his task Adam Smith devoted six of the nine chapters of his fourth book, and his treatment of 'protective import duties,' of 'drawbacks,' of 'bounties,' of 'treaties of commerce,' and of 'colonial restrictions' was so convincing that it did even more than the positive arguments in favor of free trade, contained in other parts of his work, to discredit the policy of trade restriction, which in 1776 still commanded the support of nearly all classes. But changes were at work, even as Adam Smith wrote, which were destined to convert many of the very merchants and manufacturers of whom Adam Smith despaired to the doctrine which he advocated.

The first prominent statesman to show the influence of Adam Smith's teaching was William Pitt, the younger. To him is ascribed the clause in the Act of Union with Ireland (1800) providing for complete freedom of trade between the two countries after 1820. Although this provision was not carried out, free-trade opinion had made such progress by the latter year that the merchants of London, headed by Thomas Tooke, presented a petition to Parliament in favor of revising the tariff in the direction of freer trade. An important factor in bringing about this result was the corn-law controversy carried on between the well-known economists Malthus and Ricardo in 1814-15, and the publication in 1817 of the latter's *Principles of Political Economy*. Ricardo put the theoretical argument in favor of free trade in a clearer and more convincing form than had Adam Smith. Furthermore, he enjoyed the advantage of being known as a practical and very successful man of business, rather than as a mere closet philosopher.

Official recognition of the growing influence of free-trade sentiment was accorded in 1823 by the appointment of William Huskisson to the presidency of the Board of Trade. Through his initiation Parliament passed several important statutes from 1823 to 1828 mitigating the severity of the navigation acts, reducing the number of dutiable articles, and scaling down the rates on those which continued to be taxed. The reform of Parliament in 1832, and of the Poor Law in 1834, diverted attention temporarily from the tariff question; but a crop failure in 1836 again brought the corn duties prominently to the front. Early in 1837 an Anti-Corn Law Association was formed in London by men prominent in public life. The following year a similar association was organized in Manchester, and in 1839 these associations, and others which had been formed in different parts of England, were fused into the National Anti-Corn Law League. From that year until 1846, when the repeal of the corn laws was definitely entered upon, agitation for free trade was carried on continuously, and with ever-increasing enthusiasm and confidence. The leaders in the movement were Richard Cobden and John Bright, representatives of the manufacturing interests of Manchester. It was this circumstance which gave rise to the custom, still common in Germany,

of applying the designation 'Manchester School' to the English advocates of free trade, who are credited with more extreme *laissez-faire* views of government than even Cobden and Bright really entertained. See BRIGHT, JOHN; COBDEN, RICHARD; CORN LAWS.

In truth, there was good ground for opposition to the policy of protection as practiced by England prior to 1846, quite aside from the general question of the advantages of free trade. The most galling of the protective duties were on the food materials which entered into the every-day consumption of the English laborer. Under the English land system the high prices for agricultural products which resulted from the grain duties redounded almost entirely to the benefit of the land-holding aristocracy. The laboring masses had to pay more for bread than was paid in neighboring countries, in order that the land-holding class might enjoy high rents. Mean-time manufacturers had to pay wages adjusted to the high cost of living, and see themselves outstripped in foreign markets by the rival manufacturers of other countries who bore no such burden. It was hard to make such a policy seem either wise or just in a country which was coming to depend more and more for its prosperity upon the success of its manufacturing industries. In fact, the system was doomed from the time that the Reform Act of 1832 gave representation in Parliament to the manufacturing towns of the north, and the country needed only a clear demonstration of the way in which the grain duties actually worked to induce it to demand their abolition. This demonstration was given in 1845, when the potato famine in Ireland cut off one important article of diet, and the grain duties were seen to stand like a dead wall between the starving masses of Great Britain and the abundant food supplies to be had from the Continent. At this crisis Sir Robert Peel, who had long acknowledged free trade to be the goal toward which the policies of all countries should be directed, refused to stand out longer against the demands for repeal. He was unable to carry his colleagues in the Ministry with him, but was soon recalled to form a new Cabinet, under which, after a long fight, the obnoxious duties were reduced and their ultimate abolition was brought about by the act of Parliament of June 26, 1846. The present policy of complete non-protection was introduced in 1869.

The following table indicates the progress in the reduction and simplification of the British tariff made from 1787 to 1876:

YEAR	Principal articles dutiable	Minor articles dutiable	Total articles dutiable
1787.....	290	1135	1425
1826.....	432	848	1280
1841.....	564	488	1052
1849.....	233	282	515
1855.....	153	261	414
1861.....	19	123	142
1876.....	10	32	42

In November, 1902, there were twelve distinct articles on the dutiable list—viz. cocoa, coffee, chicory, dried fruit, molasses, sugar, tea, tobacco, wine, beer, glucose, and spirits.

The present policy of England realizes the free-trade ideal of imposing no duties that can tend

to protect or encourage home industries by means of the following expedients:

(1) Most of the dutiable goods (e.g. coffee, tea, cocoa, wine, etc.) are such as cannot, for climatic reasons, be profitably produced in England.

(2) The duties on tobacco, a commodity which might be produced in England, are rendered non-protective by the simple prohibition of such production in the United Kingdom. This policy dates from the reign of Charles II., and has become so familiar as to involve little or no hardship.

(3) The duties on goods like beer, spirits, etc., which are produced in England, are exactly offset by internal-revenue duties which place the home producer in the same position, so far as taxation is concerned, as the foreign producer. The practice of storing such goods, whether produced at home or imported, in bonded warehouses, makes the administration of this policy easy. The only exceptions to the general principle that no favor shall be shown to home as distinct from foreign producers are in connection with ship subsidies for the benefit of the merchant marine, and certain slaughter-house regulations which put foreign producers of live stock at a disadvantage. The former is defended as a necessary feature of the postal system, and the latter on sanitary grounds.

Extended attention has been given in this article to the free-trade policy of England, because that nation is the only important one to follow such a system. Its example is followed by British India, Hong Kong, and the Straits Settlements. On the Continent of Europe, Holland and Belgium have tariffs that are only slightly protective. All other European countries, and all other countries outside of Europe, however, are committed to the policy of protection. It is thus not far from the truth to characterize free trade as the British policy, in distinction from protection, which is the policy of the rest of the world.

In presenting the arguments in favor of freedom of trade, we will begin with the advantages claimed for this policy, and conclude with the disadvantages attributed to the opposite policy, protection.

As Adam Smith long ago pointed out, a principal cause of the industrial progress of the world is the division of labor and the specialization and organization which accompany it. Many men, each working at a special task and sharing his products with his fellows, can produce vastly more in a given time than the same number, each trying to produce for himself all the things that he requires. But one condition of the division of labor is opportunity to exchange one's special products for the needed products of others. *Free exchange* thus gives the widest extension to the division of labor. Obstacles to free exchange prevent the would-be specialist from giving all of his time to the occupation for which he is best fitted, because they prevent him from disposing of his products advantageously, and compel him to produce a variety of things for himself, or else go without them. When such obstacles are natural—as barriers to the transportation of goods from one mountain valley to another—the situation is unfortunate, but perhaps irremediable. When they are artificial—as are the *octroi* duties which

prevent the free exchange of the products of town and country in certain European countries—they should be condemned. But the same reasons that make a free exchange of goods within a country advantageous make freedom of trade desirable. Political boundaries do not alter the essential nature of exchanges, nor the benefits that accrue to society from having them as free as possible. Foreign trade, like domestic trade, is at bottom an exchange of goods for goods, in which less-desired commodities are given for more-desired commodities, to the mutual advantage of both parties to the transaction. As different individuals are unequally fitted to carry on different pursuits, and gain an advantage by an arrangement which allows each to follow his bent, so different countries are unequally adapted for different industries. Freedom of trade, which permits the capital and labor of each country to find employment in those industries for which it is best fitted, serves to increase the aggregate output of goods in the same way that free exchange does in the case of individuals. From it there results a 'territorial division of labor,' by which each part of the world is devoted to those industries for which nature has adapted it, and through which the aggregate productiveness of the world's labor and capital is immensely increased. The chief purpose of foreign trade is to enable the world to benefit from this territorial division of labor—to permit, for example, a country like Brazil to produce coffee, not merely for its own inhabitants, but for the world; a country like Cuba to produce sugar; a country like Italy to produce olives, fruits, and silk; a country like the United States to produce corn, wheat, and the important metals. The greater the freedom of trade between countries, the greater the inducement which is held out to each to use its labor and capital in the ways calculated to contribute most to the world's wealth.

In spite of the above advantages of freedom of trade, modern countries persist in maintaining their protective systems. Advocates of free trade condemn protective duties on several grounds. Their tendency, it is urged, is to divert labor and capital from unprotected industries, where they must otherwise find investment, to the protected industry. But this must mean curtailed production. If it was desirable to invest in the protected industry, business men would have done so without any encouragement. That they needed encouragement is proof positive that the favored industry can only be carried on at a national loss. The protective duty cannot cause labor and capital to spring up out of the ground. All it can do is to influence the use to which the available supplies of labor and capital are put. These supplies set a limit to the amount of industry that can be carried on. If diverted from industries not needing protection to those requiring it, the available labor and capital must produce less in the aggregate. The policy involves, therefore, a national sacrifice. Unless good reasons for such a sacrifice are advanced, protection must stand condemned. Of course protectionists have reasons for their policy which they consider good, but to advocates of free trade they seem inadequate.

Other arguments against a protectionist policy, and therefore in favor of free trade, are begin-

ning to be urged in the United States. First, protection is condemned on political grounds. Its tendency is to rear up a group of favored industries. Business men interested in these industries have a special inducement to watch tariff measures which others in the community lack. They are too apt, under these circumstances, to become lobbyists and corruptionists. Through them representatives, charged with shaping the tariff policy, are subjected to influences from which legislators ought to be exempt. Secondly, protection is accused of being in practice a policy of change. To be effective protective duties must adapt themselves to changing industrial conditions. But changes are always disturbing to business, and at times disastrous. Free trade, by making no discrimination between the home and the foreign producer, does not subject business to arbitrary fluctuations. Third, protection is criticised on financial grounds. Since the purpose of a protective tariff is not primarily revenue, the income which it affords to the Government bears no regular nor constant relation to the latter's financial needs. At times it may burden the public treasury with an awkward surplus, which encourages reckless extravagance on the part of the legislature. At others it may fail to bring in even that necessary minimum without which the business of Government must be seriously interfered with. Finally, certain protective duties are attacked as responsible for the trusts (q.v.). The argument is that without protection the branches of production concerned would have been open to world-wide competition, and that no merely national trust would have served to secure the monopoly powers after which the trusts are supposed to hunger. If protection has created trusts, and trusts are undesirable, protective duties ought to be reduced, it is urged, until the offending trusts feel the wholesome restraints of foreign competition. The conclusiveness of these arguments against protection can be determined only by weighing them against the counter-arguments in favor of that policy, for which see the article on PROTECTION, and references there given.

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FREE WILL. The power of choosing without external compulsion. In theology the question of free will is the question as to the nature of the will and of its action in making choices. Considered as a purely psychological question, it is as neutral as the question as to the nature

and action of the affections, or of the process of syllogistic reasoning. But it is in the will that personality is viewed as centring; and since responsibility for action is ascribed to every person, it is in the will that this responsibility is conceived to reside. Choice is also the essential element of every right and every wrong action; and hence sin, its nature, origin, and guilt, are connected with the will and illustrated by it. Hence it would seem that a correct theory of the will is essential to correct views upon all these great subjects:

The main question may be comprehensively stated thus: The action of the will is always performed in the presence of motives. These are the objects presented for possible choice, with the reasons outside of the individual who is to make the choice for and against them, and the further reasons arising from his own inner condition and history. Is the act of choice an effect, depending in some way upon these motives, or is it an exercise of the power of primal causality residing in the man? Theories maintaining the first of these alternatives may all be classed under the general title of 'deterministic'; and the others will then be called 'indeterministic.'

1. The chief deterministic theories are the following:

(1) The theory that motives are causes operating upon the will, and that a volition is as strictly a caused event as the explosion of a pile of gunpowder. The forms of stating this theory will differ according as the philosophy of the theorist is materialistic or spiritualistic. If the former, as is the case with Herbert Spencer, the causation will be viewed as of exactly the same nature as all other causation. There is ultimately but one force in the universe and but one mode of operation, however different the individual forms may ultimately appear. Or if the latter, as was true of Edwards, the causation will be viewed as different because of the difference of the two terms connected in cases of physical and of volitional causation, not because of 'the nature of the connection.' For this theory, in all its various forms, there is ultimately but one argument, the inconceivability of an uncaused event. Edwards has no other argument. Even his famous *reductio ad absurdum*, by which he sought to confound his adversaries, is at bottom nothing else, for 'determining' an act of the will, he says, must be by another act of the will, if it is a case of 'self-determination,' which is as much as to say that, somehow, the will must be caused in every act.

No doubt the element in this theory which has made it attractive to so large a school of theologians (Calvinists quite generally have accepted it) is its ready applicability to the doctrines of the divine foreknowledge (q.v.) and government. If God foreknows all His own acts, He foreknows all the motives that will surround the first moral acts of men, and hence foreknows what those acts will be; and therefore He knows the whole series of motives that ever will operate upon men, and consequently all their volitions and all their acts. Thus also He governs men. The motives that act upon men are all, ultimately, brought to bear upon them by God, for they are all either the direct result of His own divine acts or the indirect result of the same. Since these motives govern men's volitions, God absolutely governs them. The great theological objection against this theory also arises from the same considera-

tions. True activity, responsibility, and virtue or vice, are thus removed from the creature and placed in God. The man choosing is nothing but a link in the chain of causes and effects, and has no more true agency than a billiard-ball in front of a cue. If there can be said to be such a thing as sin at all, God is its author, because the only real agent in the whole universe. Edwards repelled these objections by saying that the moral character of an act lay in its nature and not in its origin. He drew a line at the moment of volition. All that goes before volition, surrounding it with incentive and eliciting it, is of God. The act and what necessarily follows it are man's.

(2) The next theory is substantially the same as the preceding, except that it does not introduce the element of ontological explanation of the uniformity of the will's action under uniform conditions. It simply affirms that the same antecedents are invariably followed by the same consequents. Hence the action of the will can be accurately predicted by any one possessed of competent knowledge of the circumstances, and hence the reign of law in human affairs is perfectly provided for. In this form the theory was propounded by John Stuart Mill, and is essentially the theory of Kant, who taught that the 'category' of causation applied simply to phenomena. Both these writers stripped causation, as applied to the world of sensation, of all power. The great argument for Mill's theory is the fact of law in human affairs. Given a rise in the value of breadstuffs, there will be a diminution in the number of marriages and an increase in the number of suicides. In any long series of years the fluctuations in the prices and in the social events mentioned will follow each other in a perfect parallelism. Law in the phenomena of society is a fact. But the theory is objected to as not being a theory at all, but only a register of facts, and again as not conforming to the facts it professes to register. Certainly it can never be proved that any combination of antecedents ever exactly recurs, or that any consequent is precisely the same as any other.

(3) Closely allied to these views is a theory recently set forth, and quite in accord with a certain drift in modern thought, of which Prof. John Dewey may be taken as the representative. It is the theory of 'logical determinateness.' The theories already reviewed and most others are said to have been concerned about a 'self-made' question, beside the point, altogether impertinent and superfluous. They have set up a dualism between the actor and his deed which does not exist. We are to go to psychology for the actual process of choice, and in that process we shall see the truth. A child sees a bright object, let us say the flame of a candle. The infant's impulse is to seize this bright object. But when it does this the object reacts upon the child, a new impulse is aroused, and so by a process of 'mediation of impulses' there comes out a distinct line of conduct. It is a tentative process, a trying in fact or imagination of this or that to adjust it to other impulses. It is all a process of choice, for it is all activity, and activity is the will. Hence freedom is easily defined. It is such activity. "Impulse is self; the developing ideal is self; the reaction of the ideal as measuring and controlling impulse is self. The entire voluntary process is one of self-expression, of coming to consciousness of self.

This intimate and thorough-going selfness of the deed constitutes freedom." The great argument for this theory is its claim to correct psychological analysis. The objections to it are that it does not provide for any self except the bundle of concrete phenomena; that it does not correctly analyze the volitional action of the mature mind; and that it does not rise at all to the consideration of deliberate choice, such as is formed at the great moments of decisive human action. From a theological point of view, whatever objections would apply to the theory of Mill would apply to this.

II. The theory of indeterminism may be stated as simply this: That the soul possesses the power of choice between proffered alternatives; that, however it may act when it does not deliberately exercise its ultimate powers, when it does, it acts as a first cause, originating the choice and determining it not by any other act, but in and by the act of choice itself. Otherwise expressed, if the motives before the will on any two occasions were exactly the same—the word motive being understood to include all things, objective and subjective, capable of influencing the will in the choice—the choices might be different. The theory does not deny the influence of motives, the custom of the will to follow habitual lines of choice, the rationality of man and his tendency to choose what in his best judgment is most for his advantage, and the determinate effect upon the will of external conditions. It maintains that in cases of automatism the action of the will is mechanical; but it is not discussing such action. In cases of rational action it teaches that the will follows the preponderating motive not by causation arising from that motive, but by free self-causation. It may compress its statement into the form that in every case of deliberate action, supposed by the agent himself to be free, the will chooses the object, and is not chosen and controlled by the object.

The arguments for this position are all resolvable into one, that such is the testimony of consciousness. By consciousness is meant not feeling, sentiment, received opinion, but the knowledge which the mind by its own native powers has of its own action whenever it acts. When it thinks, it knows that it thinks, and knows what thinking is, discriminating it from all other activity, never mixing it with feeling. So, when the mind chooses, it knows that it is choosing, not thinking, not feeling, and it knows what it is that it does in choosing. It knows that it exercises original power, and acts as a first cause.

The theory is further supported by the ease with which it is made harmonious with the primary ethical ideas. Freedom, on the deterministic theory, can be nothing more than Jonathan Edwards allows—liberty to act as we have chosen; but I do not feel free unless I have the power of sovereign choice. If I am a link in a series of causes and effects, I have no more real responsibility than the billiard-ball has for its course. But if I do whatever I do because I have myself, apart from all compulsion, physical or spiritual, deliberately chosen, then my act is truly mine, and I am responsible for its nature and its consequences.

The great objection to this theory is that primal causality in man is inconceivable. Granting that it is conceivable in God (which some determinists have denied), it cannot be conceived in a

dependent creature like man. The advocate of indeterminism does not feel called upon to show its conceivability in the sense of showing how it has come about that man is a first cause, but contents himself with exhibiting the fact, upon the basis of the declarations of consciousness. The objection that the theory teaches that there are uncaused events is answered by saying that the volition is caused by the man, or that it is an example of the operation of original causality, and thus not uncaused. The great theological objection to this theory is its alleged failure to provide for the foreknowledge and government of God. It does certainly provide for most of the foreknowledge of God, for men's actions are very largely upon the basis of general reasonableness, even under this theory, and are hence largely predictable to fallible men, and much more so to an infinite God. God knows His own acts from all eternity, and must equally well know their consequences, among which will be the great majority of the acts of His free creatures. Some indeterminists have declared that the number of acts thus not foreknown would be infinitesimal, and so negligible. Others have given a larger play to the element of uncertainty, but have said that God foreknows all the possibilities of action, and thus is infinitely prepared for any action of men in any case. The gross exaggeration of Edwards, that indeterminism threw the whole universe into utter confusion, needs no refutation. If there were confusion it would not be important. The advantage of this theory as to the divine government is that it emphasizes the fact that the government of God over the actions of men is a truly moral government, one by persuasives and not by forces. If motives are virtual causes, there is no difference between the government of men and that of the planets.

Consult: Edwards, *Freedom of the Will* (London, 1754); Spencer, *Psychology* (New York, 1889); Mill, *Logic* (London, 1856), and id., *An Examination of Sir William Hamilton's Philosophy* (London, 1878); Dewey, *Study of Ethics* (Ann Arbor, 1894); Martineau, *Study of Religion* (Oxford, 1888); James, *Principles of Psychology* (New York, 1890), and id., *Will to Believe* (London, 1897); Howison, *Limits of Evolution* (New York, 1901); Ward, *Essays on Philosophy of Theism* (London, 1884); Gutherlet, *Die Willensfreiheit und ihre Gegner* (Fulda, 1893); Schlotten, *De vrije wil* (Leyden, 1859; Ger. trans. Berlin, 1874); Luthardt, *Die Lehre des freien Willens* (Leipzig, 1863); Piat, *La liberté* (Paris, 1894-95).

FREE-WILL BAPTISTS, or FREE BAPTISTS. See BAPTISTS.

FREEZING-MIXTURES. Mixtures of substances used to produce low temperatures. The frigorific effect of such mixtures generally depends upon the following facts: (1) Melting, or the passage of a substance from the solid state to the liquid, involves the conversion of *sensible heat* into 'latent heat,' and if no heat is added to a melting substance from without, part of the sensible heat of the substance itself disappears, and therefore the temperature falls; (2) the solution of many salts in water causes the absorption of heat, and hence, again, if there is little or no addition of heat from the surroundings, there is caused a fall of temperature. The efficiency of the first of these causes may be seen from the

following: If a piece of ice having the temperature of 0°C . (32°F .) is placed in its own weight of water at 79°C . (174.2°F .), it is found that after the ice has melted, the temperature of the liquid is reduced to 0°C . (32°F .), much of the sensible heat which the water contained having thus disappeared during the melting of the ice. The lowering of temperature by solution is illustrated in a striking manner by the fact that ammonium sulphocyanide, if thrown into its own weight of nearly boiling water, will reduce the temperature to the point of freezing; if thrown into its own weight of water of ordinary temperature, the same salt will reduce the temperature to -21°C . (-5.8°F .). In the mixture of pounded ice and salt used in making ice-cream, the lowering of the temperature is due both to the conversion of sensible into latent heat during the melting of the ice, and to the absorption of heat during the solution of the salt. The following table shows the more important freezing-mixtures and the temperatures that may be obtained by the use of them. Supposing that there is no absorption of heat from the surroundings, the fall of temperature produced by mixing a given set of substances is determined by the amount of sensible heat absorbed (i.e. the heat of fusion and solution) and by the specific heats of the substances between the initial and final temperatures. The temperatures obtained depend, of course, upon the initial temperatures of the mixtures. The initial temperature of any mixture given in the following table, unless otherwise specified, is assumed to be the freezing-point of pure water.

FREEZING-POINT. The temperature at which a given substance can exist partly in the solid, partly in the liquid state. If, while the substance is partly solid and partly liquid, heat is added to it, some of the solid portion melts, the added sensible heat changes into 'latent heat of fusion' (see FREEZING-MIXTURES), and, as long as the solid portion lasts, the temperature remains constant. Again, the abstraction of heat can only be effected at the expense of the latent heat of the liquid portion, which is thereby gradually solidified; and hence, as long as the liquid portion lasts, the temperature remains constant. If heat is neither added nor abstracted, the solid and the liquid portion remain in equilibrium; i.e. neither does the solid melt, nor the liquid solidify. Now, as long as this equilibrium exists, the vapor-tensions of the solid and liquid portions must be precisely equal. If the vapor-tension, say, of the liquid were greater than that of the solid, a process of distillation would take place, the solid tending to increase at the expense of the liquid; but the excess of solid would immediately melt, so that the equilibrium might be reestablished; meanwhile, more of the liquid would be transformed into solid by distillation, and so on *ad infinitum*. The distillation could of course be employed for the production of mechanical work; and as it would go on at the expense of the heat from the surroundings, it might be employed perpetually for the transformation of the heat, say, of the ocean into mechanical work. Any process of this kind has been conclusively proved to be impossible. (See THERMODYNAMICS.) And as the assumption that the

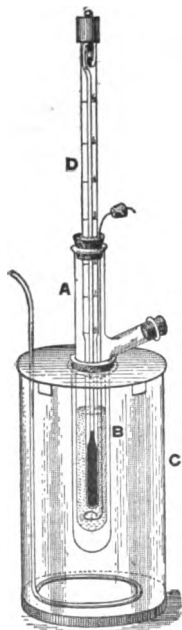
SUBSTANCES (PARTS BY WEIGHT)	Temperature attained	
	Cent.	Fahr.
100 parts of snow and 33 parts of common salt.....	-21°	-5.8°
100 parts of snow and 300 parts of crystallized calcium chloride.....	-48.5°	-55.3°
100 parts of snow and 100 parts of dilute sulphuric acid (Initial temperature, 5°C , or 41°F .).....	-41°	-41.8°
100 parts of snow, 13.5 parts of potassium nitrate and 26 parts of ammonium chloride.....	-17.8°	0°
100 parts of snow, 52 parts of ammonium nitrate, and 55 parts of sodium nitrate.....	-25.8°	-14.4°
100 parts of snow, 9 parts of potassium nitrate, and 67 parts of ammonium sulphocyanate.....	-26.2°	-18.8°
100 parts of snow, 13 parts of ammonium chloride, and 37.5 parts of sodium nitrate.....	-30.7°	-23.3°
100 parts of snow, 32 parts of ammonium nitrate, and 59 parts of ammonium sulphocyanate.....	-30.6°	-23.1°
100 parts of snow, 2 parts of potassium nitrate, and 112 parts of potassium sulphocyanate.....	-34.1°	-29.4°
100 parts of snow, 39.5 parts of ammonium sulphocyanate, and 54.5 parts of sodium nitrate.....	-37.4°	-35.3°
100 parts of water, 26 parts of ammonium chloride, and 14 parts of potassium nitrate.....	-17.8°	0°
100 parts of water, 18 parts of ammonium chloride, and 43 parts of sodium nitrate.....	-22.4°	-8.3°
100 parts of water, 55 parts of sodium nitrate, and 52 parts of ammonium nitrate.....	-25.8°	-14.4°
100 parts of water, 57 parts of sodium nitrate, and 57 parts of ammonium sulphocyanate.....	-29.8°	-21.6°
100 parts of water, 9 parts of potassium nitrate, and 67 parts of ammonium sulphocyanate.....	-28.2°	-18.8°
100 parts of water, 32 parts of ammonium nitrate, and 59 parts of ammonium sulphocyanate.....	-30.6°	-23.1°
100 parts of water, 5 parts of ammonium nitrate, and 113 parts of potassium sulphocyanate.....	-32.4°	-26.3°
Solidified carbon dioxide and ordinary ether.....	-100.0°	-148°

Substances employed as freezing-mixtures, if solid, should be finely powdered, rapidly mixed, and placed in vessels that have but little conducting power. These freezing-mixtures are only available for use on a small scale. A fact extensively utilized for the production of low temperatures on a large scale is that, like the liquefaction of solids, the evaporation of liquids, too, involves the absorption of considerable amounts of sensible heat. See EVAPORATION; REFRIGERATION; FREEZING-POINT.

vapor-tension of the liquid portion is not greater, but less than that of the solid portion, leads to a similar impossibility, we conclude, as stated above, that as long as the solid and liquid portions of a substance are in equilibrium, the vapor-tensions of the two portions must be equal. The freezing-point of a given substance may therefore be defined as the temperature at which the substance has the same vapor-tension in the solid and in the liquid state. In the case of a single chemical substance (i.e. not a mixture),

that temperature may be referred to either as the freezing-point of the liquid, or as the melting-point of the solid. Thus the freezing-point of water is the same as the melting-point of ice. In the case of solutions, however, the temperature at which freezing commences is not by any means the same as that at which, if entirely solidified, the mixture would begin to melt.

FREEZING-POINT OF SOLUTIONS. An important fact to be remembered in connection with freezing solutions is that ordinarily the pure solvent alone freezes out. It will be seen further that the freezing-point of a solution is the lower the greater the amount of substance dissolved. While, therefore, the solvent alone is freezing out, the temperature must obviously fall. Hence, if we wish to speak of the freezing-point of a solution of given strength, we must necessarily refer to the temperature at which freezing just commences; for freezing changes the composition. Experience shows, however, that unless the given solution is very concentrated, and unless the amount experimented upon is very small, a moderate quantity of the solvent may be allowed to freeze out, without the result of the observation being thereby considerably impaired. In other words, under proper experimental conditions, the difficult determination of the point at which freezing just commences is unnecessary. The freezing-point of solutions is now generally determined by the use of Beckmann's apparatus shown in the accompanying figure. The



BECKMANN'S APPARATUS.

The outer jar, C, contains some liquid whose temperature is kept rigidly constant and a few degrees below the freezing-point of the given solution, a glass stirrer serving to keep the temperature uniform throughout the volume. The wide tube, B, contains nothing but air and serves to prevent the too rapid cooling of A. In making an observation, a known amount (say, 20 grams) of the pure solvent is introduced into the strong inner test-tube, A, through the side-tube; and when freezing has set in and the thermometer shows a constant temperature, the latter is carefully noted. In this manner the freezing-point of the pure solvent becomes exactly known. Next, a known amount of the substance to be dissolved is introduced to the solvent in A, again through the side-tube; the contents of A are caused to melt by removing A from B, and when all is dissolved A is replaced in B; again, when freezing has set in and the thermometer shows a constant temperature, the latter is carefully noted. In this manner the freezing-point of the solution too becomes exactly known, and then the difference between the freezing-point of the pure solvent and the solution of known strength can be found by a simple subtraction. A great many determinations

of this nature, carried out with a great variety of substances, have led to the establishment of the following law: *The freezing-point of a solution is invariably lower than that of the pure solvent, the difference being, for the same substance, proportional to the amount, and, for different substances, not only proportional to the amounts, but also inversely proportional to the molecular weights of the substances dissolved.* A comparison of this law with the one that holds good for the lowering of the boiling-point (see **BOILING-POINT**) will show the perfect analogy between the two laws. Here, too, as in the case of the boiling-point, the simple law holds good only for substances whose solutions do not conduct electricity, matters being much more complicated in the case of solutions of electrolytes. (See **DISSOCIATION**.) In the case of solutions of non-electrolytes, determinations of the freezing-point of solutions permit of ascertaining the molecular weight of newly discovered substances; and this is the purpose for which freezing-point determinations are now mostly made. All that has to be done is to determine the freezing-points of the pure solvent and of two equally strong solutions in the same solvent: one containing the new substance, the other some substance of known molecular weight, and then the molecular weight of the given substance is found simply by the rules of proportion. The solvents most frequently employed for such determinations are glacial acetic acid, water, and benzene, acetic acid being the most useful of the three. Still, other solvents too can be and are sometimes employed. See **MELTING-POINT**; **SOLUTION**; **MOLECULES—MOLECULAR WEIGHTS**.

NERNST'S THEORY OF THE FREEZING-POINT. The determination of the freezing-point, as explained above, seemed to be a perfectly reliable operation, until experience had shown that considerably different results are obtained by using apparatus different in size and shape, by having different temperatures in the outer jar (C), and by varying the rate of stirring in the inner tube (A). In 1894 Nernst gave a mathematical explanation of this important phenomenon—important because of its connection with the theory of solutions and with the determination of molecular weights. The principle of Nernst's calculations is as follows: The temperature in the outer jar (C) is, as we have seen, kept a few degrees below the freezing-point of the given solution. If the latter did not freeze and were not stirred, heat would flow from it into the outer vessel until the temperature in A and in C would be the same. This flow of heat would take place, for a given form of apparatus, at a rate proportional, at any instant, to the difference of temperature, at that instant, between A and C. On the other hand, regular stirring would cause the formation of sensible heat in A at a constant rate. When the steadily diminishing rate of the outflow of heat from A to C becomes equal to this constant rate of production of heat in A, the temperature in A must evidently become constant. This constant temperature Nernst terms the 'convergence-point.' All this, however, presupposes that the liquid in A does not freeze. Suppose now that as soon as the solution has reached the convergence-point, freezing has set in; and suppose that in a given case the con-

vergence-point is lower than the freezing-point. During freezing, the latent heat of fusion is evolved as sensible heat, and the temperature rises, tending to approach the true freezing-point of the solution. There is experimental evidence to the effect that the rate at which the temperature thus rises is, at any instant, proportional to the distance of the temperature at that instant from the true freezing-point. In other words, the nearer to the true freezing-point, the slower the freezing, and hence the slower the variation of the temperature caused by it. But 'the nearer to the true freezing-point' means 'the farther from the convergence-point'; and we have seen that the farther from the convergence-point, the more rapid the rate of variation in the direction of that point. There must therefore exist, somewhere between the true freezing-point and the convergence-point, a point at which the rates of variation upward toward the true freezing-point, and downward toward the convergence-point, are precisely equal. That point Nernst terms the 'apparent freezing-point.' And he justly maintains that, everything being taken into account, the temperature usually observed, after variation has ceased, is not the true freezing-point, which is, of course, dependent on nothing but the nature and strength of the given solution, but the apparent freezing-point, which may obviously depend on the temperature of the outer jar, on the amount of solution experimented upon, on the rate of stirring, on the specific rate of freezing or melting of the solvent, etc. The effect of stirring is so considerable that in several cases the convergence-point has been found to lie, not below, but above the true freezing-point, in spite of the somewhat low temperature in the outer jar. In such cases, too, the apparent freezing-point is, of course, somewhere between the true freezing-point and the convergence-point. The difference between the true and apparent freezing-points is, as might be readily supposed, not very great. In fact, in many cases (e.g. in the case of common salt) it may be safely neglected. In other cases, however (e.g. in the case of weak solutions of cane-sugar), it must be taken into account if results at all reliable are to be obtained. The exact way of applying the theory in practice, with a view to ascertaining the true freezing-point of solutions, may be found described in the original memoir, by Nernst and Abegg, in vol. xv. of the *Zeitschrift für physikalische Chemie* (1894). It scarcely needs to be added that at the apparent freezing-point there is really no equilibrium between solid and liquid; that either melting of the solid portion or freezing of the liquid portion is continually going on, according as the apparent freezing-point is above or below the true freezing-point of the solution.

'CRYOHYDRATES.' We have seen above that generally the pure solvent alone freezes out of solutions, and that the freezing out of much of the solvent would cause a corresponding depression of the freezing-point. In other words, if freezing was allowed to go on to a large extent, the given solution would become more and more concentrated and the temperature would fall lower and lower. Finally the solution would become saturated. Further freezing would then naturally cause the precipitation

of the substance dissolved; the concentration of the solution would remain constant, and hence the freezing-temperature, too, would remain constant. At one time, solutions thus having a constant freezing-point were taken to be chemical compounds of the dissolved substances with the solvent, and were therefore named 'cryohydrates.' It is now clear, however, that there is no more reason for such an assumption than there is for assuming that, in general, any saturated solution is a true chemical compound. The substance freezing out of a saturated solution is nothing but a chemical mixture of the frozen solvent and the substance originally dissolved, and, of course, the melting-temperature of this mixture, being identical with the freezing-temperature of the saturated solution, is likewise constant. It is also clear that the melting-point of the 'cryohydrate' is the lowest temperature at which a solution of a given substance in a given solvent can exist. Hence, by mixing ice with salts in the proportion in which they would form 'cryohydrates,' we can obtain freezing-mixtures having the lowest constant temperature that can possibly be attained with the given salts. 'Cryohydrates' are now classed with the so-called 'eutectic mixtures.' See MELTING-POINT.

FREGENAL DE LA SIERRA, frá'há-nál' dá lá sé-ár-rá. A town in the Province of Badajoz, Spain, 50 miles south by east of the city of Badajoz (Map: Spain, B 3). It is situated in a fertile and picturesque valley among mountains, and is laid out with regular and spacious streets. There are plazas and some buildings of merit. The ancient castle, which was erected by the Templars to whom the town was granted in 1283, has been converted into a bull-ring, capable of seating 4000 persons. The town has a considerable trade in animals, and manufactures cloth, baize, hats, leather, flour, etc. Population, in 1900, 9582.

FREHER, frá'ér, MARQUARD (1505-1614). A German historian, born at Augsburg. He studied law at Altdorf and Bourges, was professor at Heidelberg (1596-1614), and was frequently sent as Ambassador to Poland and other countries by the Elector Frederick IV. He published several important historical works in Latin, among which the *Origines Palatinae*, with its interesting information on Heidelberg and other early German settlements, is, perhaps, the most important. It was first printed in 1599, and has since been frequently republished.

FREIBERG, frí'berk. An old and important town of Saxony, the centre and seat of the mining district and mining administration of Saxony, situated on the northern slope of the Erzgebirge, 25 miles by rail southwest of Dresden (Map: Germany, E 3). Freiberg retains portions of its fortifications and presents an ancient appearance. The Late-Gothic cathedral was constructed in 1490-1512, on the site of a Romanesque church, which was burned down in 1484. The southern portal, known as the Golden Door, is a relic from the ancient church. The sculptures on the door are considered among the finest of the plastic ornamentations of the Middle Ages. The church contains objects worthy of interest, among them the burial-vault of forty-one Protestant Saxon princes. The large organ was built by Silbermann. The old castle of Freudenstein, construct-

ed in 1572, and now used as an arsenal, the Late-Gothic Rathaus dating from the beginning of the fifteenth century, and the sixteenth-century Kaufhaus, with its museum of antiquities, are the prominent secular buildings of the city. Among the educational institutions are a gymnasium dating from 1515, and the famous mining academy, founded in 1765, and attended by students (about 450) from all parts of the world. The school possesses extensive geological and mineralogical collections, chemical and assay laboratories, a library, and the Werner Museum.

Freiberg has large smelting-works, foundries, and other establishments connected with mining. The mines are owned by the State, and are annually visited by many mining experts and tourists. There are manufactures of gold and silver wire, machinery, leather, woolens, fertilizers, etc. The city is well provided with schools, museums, scientific associations, and hospitals. It is lighted by gas and electricity and has an electric street railway. Population, in 1890, 28,955; in 1900, 30,175, including about 1000 Roman Catholics. The town owes its origin to the discovery of silver in the vicinity in the twelfth century. It was strongly fortified, and obtained municipal privileges about the beginning of the thirteenth century. After being subject to various rulers, Freiberg fell to the Saxon Albertine line in 1485. Consult: Gerlach, *Kleine Chronik von Freiberg* (Freiberg, 1898); *Freibergs Berg- und Hüttenwesen, herausgegeben durch den Bergmännischen Verein zu Freiberg* (ib., 1893).

FREIBURG, frī'boorĕk. The attractive capital of a district of the same name in the Grand Duchy of Baden, Germany, and the former capital of Breisgau (q.v.), situated in the charming valley of the Dreisam, about 11 miles east of the Rhine and 72 miles south-southwest of Karlsruhe (Map: Germany, B 4). The environs are exceptionally beautiful, embracing a rich plain, lovely vine-clad hills, and a portion of the picturesque Black Forest. In appearance Freiburg very agreeably combines features of an ancient and a modern city. It contains numerous specimens of mediæval architecture, and there remain portions of the old fortifications. The cathedral, a rival of the Strassburg Minster, and restored since 1880, is one of the most perfect specimens of Gothic architecture in Germany. It is of red sandstone, the Romanesque transept and the side towers dating probably from the twelfth century. The choir was not completed before the beginning of the sixteenth century. The famous tower, considered the finest of its kind in Europe, with chimes and a curious clock, is 380 feet high, and has a square base, an octagonal bell-tower, and a pyramid of open stonework. The main portal is richly decorated with allegorical figures, and the beautiful interior contains numerous excellent examples of stained glass belonging to different periods, creditable monuments, and a number of masterly altar-pieces by Hans Baldung and Holbein the Younger. Other interesting ecclesiastical edifices are the Roman Catholic Church of Saint Martin, dating from the thirteenth century, with a modern tower, and the Protestant Ludwigskirche, constructed in Romanesque style in 1829-39.

The noteworthy secular buildings of Freiburg include the sixteenth-century Rathaus, adorned with frescoes; the Kaufhaus, or Merchants' Hall,

with a vaulted portico and statues of German rulers on the outer walls; the Kornhalle, with a fine concert hall; the old university, a sixteenth-century Renaissance structure, now annexed to the Rathaus; the new university, formerly a convent; the municipal theatre; and the grand ducal palace. Freiburg is not only well provided with handsome promenades, but is rich in monuments and memorial fountains, the most prominent of the former being the monument erected to the Fourteenth German Army Corps in 1876, and the monument to Berthold Schwarz, the alleged inventor of gunpowder. The celebrated university of Freiburg, founded by the Archduke Albert VI. of Austria in 1457, has four faculties, about 95 professors, and an attendance of over 1400 students. There are attached to it a library of 270,000 volumes, and a number of collections and institutes. Besides the university, there are two gymnasia and two *Realschulen*, several special schools, museums, a theatre, and numerous scientific and art associations.

In its equipment as a modern town, Freiburg has electric lights, an electric street railway, fine water-supply, a sewage farm, and several hospitals and charity houses. The city is rather prominent in the industrial world. It is especially well known for its manufactures of silk thread, glass, and pearls. There are also important manufactures of buttons, paper, furniture, scientific and musical instruments, machinery, chocolate and sugar products, wine, tobacco, cigars, etc. The trade is extensive in the local manufactures, and in agricultural products, and the city is besides the chief export point for the various industries of the Black Forest district. It has been the seat of an archbishop since 1827. Among the attractions on the outskirts is the Schlossberg, with an ancient ruined fortress and pleasure grounds. Population, in 1890, 48,788; in 1900, 61,506, including about 17,000 Protestants and 1020 Hebrews.

The foundation of Freiburg about the year 1090 is attributed to Count Berthold III. of Zähringen. It became a free town in 1120, and attained considerable prosperity. With the death of the last member of the House of Zähringen, Freiburg passed in 1218 to the counts of Urach, whose interference with the rights of the burghers was followed by popular uprisings. The city finally bought its independence in 1368 for 20,000 silver marks and passed under the protection of the House of Hapsburg. During the Thirty Years' War it was taken repeatedly by the Swedes. In 1644 a bloody engagement took place here between the French and the German Catholics. Freiburg came into the possession of Baden in 1806. In 1848 Freiburg was the scene of a conflict between the insurgents and the troops of the German Confederation. In the following year the Revolutionary Government was expelled from the town by the Prussians, who remained there until 1851.

FREIBURG (Swiss city and canton). See **FRIBOURG**.

FREIDANK, frī'dānk (Middle High German *Vridanc*). The name assigned to the author of a German thirteenth-century didactic work, entitled *Bescheidenheit*. He was probably a native of Swabia, and accompanied the crusading army of Frederick II. to the Holy Land, where he composed a portion of his poem, about 1228-29. It

is a sort of anthology of adages and moral reflections containing much worldly wisdom, and was very popular throughout the Middle Ages and well into the sixteenth century. Many manuscripts still exist of the original, which was translated into modern German by Simrock (1867), Bacmeister (1875), and Pannier (1878).

FREIGHT (ME. *freyt*, *fraught*, Dutch *vracht*, OHG. *frēht*, from Goth. *fra*, before + *aihts*, property; probably influenced by Fr. *fret*, freight, from the same source). The hire of a ship, or part of a ship, for the transport of merchandise; also the merchandise so transported. The agreement for the service is termed a charter-party (q.v.). If a merchant freight a whole ship, but neglect to fill it, the captain is not at liberty to complete the cargo from other sources, without accounting to the merchant for any moneys received for such additional load. On the other hand, if the merchant covenant to freight a certain portion of a ship, he is bound to pay the sum agreed on for that portion, notwithstanding that his goods may fail to occupy so much space. If, in the charter-party, a day be appointed for sailing, and either the merchant fail to have his goods ready for embarkation by the time fixed, or the vessel be unprepared to start—wind and weather permitting—the agreement may be declared void by the aggrieved party, who can also recover at law for any detriment caused to his property in consequence of the delay. The use of charter-parties has been traced back as far as the reign of Henry III. This contract, which in England, and generally in the commercial language of this country, is called freight, is more commonly spoken of by the legal writers of Scotland as *affreightment* (q.v.), from the French *affrètement* (Bell, *Com.*, i., p. 414), but there is no essential difference in the laws of the two countries with regard to it. Throughout the whole commercial world, indeed, in so far as its provisions are not made the subjects of positive stipulation either by charter-party or *bill of lading* (q.v.), they will be held to be in accordance with the usage of trade, and of that particular branch of trade to which the hiring has reference. The contract for freight is generally considered to be an 'entire' contract, and not capable of part performance. It contemplates the completion of the voyage and the safe arrival of the cargo at its destination. Usually, therefore, no freight is earned in the event of a loss at sea, nor in case of a delivery at any other port than the one specified in the charter-party.

It was formerly held that the payment of the wages of the crew was contingent on the earning of freight by the ship, in accordance with the maxim of Lord Stowell, that "freight is the mother of wages." But this rule, which was already subject to many exceptions, has been abrogated in Great Britain by the Merchant Shipping Act (17 and 18 Vict., c. 104), and by statute in the United States, and wages may now be recovered either by seamen or apprentices, even though no freight has been earned by the vessel; but in cases of shipwreck the claim for wages will be barred if it be proved that the man did not exert himself to the utmost to save the ship, cargo, and stores. The provision was first introduced by 7 and 8 Vict., c. 112, sec. 17, which

enacted that, in order to enable him to recover his wages, the seaman should be bound to produce a certificate from the master or chief surviving officer of the ship, to the effect that he had so exerted himself. By sec. 183 of 17 and 18 Vict., c. 104, the onus of proof is very properly laid on those who impugn the conduct of the seaman. The old rule is still adhered to in America, but it is not applied to the master, and it does not hold with reference to seamen if the freight has been lost by the fault either of the master or owner; e.g. if the ship has been seized for debt, or for having contraband goods on board.

The word freight is a term formerly applied only to maritime business, such as the hire and use of vessels, but more recently extended to goods transported on land, as on railways where there are regular 'freight' cars. The term is used to signify also the money or consideration paid for carrying. With regard to freight by ships, the laws of the United States are practically the same as in England. See CARRIER, COMMON; and TRANSPORTATION.

FREILIGRATH, frī'lik-rät, FERDINAND (1810-76). A German poet of almost bizarre originality, an admirable translator, and a sturdy liberal agitator, born at Detmold. His father was a teacher. Though apprenticed to a grocer at fifteen, Freiligrath continued his studies, and published verses in local journals before he was twenty. The years 1831 to 1836 he spent as banker's clerk in Amsterdam. Then, after publishing translations of Hugo's *Odes*, and *Chants du crépuscule*, and launching a literary journal, *Rheinisches Odeon* (1836-38), he became a book-keeper at Barmen, but continued writing lyrics, of which a volume (1838) won immediate and wide favor. This contained the famous "Löwenritt," "Prinz Eugen," and "Der Blumen Rache," probably his masterpieces. He afterwards gave himself wholly to literature, coöperating in several now unimportant works, and gaining a pension of 300 thalers from the Prussian King. Gradually his associates drew him into political strife. In 1844 he surrendered his pension, and in his *Glaubensbekenntnis* placed his poetic gifts at the service of the democratic agitation that was to culminate in the Revolution of 1848. Such poems as "Trotz alledem" (a translation of Burns's "A man's a man for a' that"), "Die Freiheit," "Das Recht," and "Hamlet," made his absence from Germany expedient. He went to Belgium and Switzerland, published in 1846 *Englische Gedichte aus neuerer Zeit*, a volume of fine translations, and *Ca ira* a collection of political songs, and lived till 1848 in England. At the invitation of Longfellow, he meditated going to America, but on the short-lived triumph of liberalism returned to Germany as a democratic leader, was for a time imprisoned, published *Zwischen den Garben* (1849) and *Neue politische und soziale Gedichte* (1850), after which he went once more into exile in England (1851), where he remained till 1868, supporting himself by office work and admirable poetic translations, among which an anthology, the *Rose, Thistle, and Shamrock* (1854), and Longfellow's *Hiawatha* (1857), with Shakespeare's *Cymbeline* and *Winter's Tale*, are worthy of record for their felicity and faithfulness. These kept up his popularity in Germany, where in 1866 a subscription of 60,000 thalers was

raised for him, partly as a political manifesto. The general amnesty proclaimed in 1868 brought him back in time to celebrate the triumph of 1870 in the popular "Hurrah, Germania!" and "Die Trompete von Vionville." Freiligrath's works are collected in 8 vols. (Stuttgart, 1870-71), and those up to 1858 in 6 vols. (New York, 1858-59). There is a volume of select translations into English, edited by his daughter, Mrs. Kroeker (Leipzig, 1871). For his biography consult: Kippenberg (Leipzig, 1868); Schmidt-Weissenfels (Stuttgart, 1876); Buchner, *Ferdinand Freiligrath, Ein Dichterleben in Briefen* (Lahr, 1881-82); Richter, *Freiligrath als Uebersetzer* (Berlin, 1899); and Rodenberg, *Jugenderinnerungen* (Berlin, 1901).

FREIMUND RAIMAR, frî'mönt rî'mär. A pen-name of the German poet Friedrich Rückert (q.v.).

FREIND, frind, JOHN (1675-1728). An English physician. He was born at Croton in Northamptonshire, graduated at Christ Church, Oxford, in 1698, entered the medical profession, and in 1705-07 acted as physician to the English army under the Earl of Peterborough in Spain. In 1722 he was a member of Parliament, but being suspected of favoring the restoration of the Stuarts, he was incarcerated in the Tower. From 1727 until his death he was physician to Queen Caroline. He published several works on medical subjects, the most important of which is his *History of Physick from the Time of Galen to the Beginning of the Sixteenth Century, chiefly with regard to Practice* (2 vols., 1725-26). His brother, ROBERT (1667-1751), was a well-known classical scholar.

FREIRE, frâ'é-râ, RAMÓN (1787-1851). A Chilean soldier and legislator, a grandson of Freire de Andrada, born at Santiago, Chile. He served in the War for Independence from 1811 to 1820, and soon thereafter became the leader of the Liberal Party, which elected him Supreme Dictator of the Government in 1823, his reelection following in 1827. In this capacity he put an end to Spanish domination in Chile in 1826, when he forced the last Spaniards to leave the island of Chiloe. Upon the accession of the Conservative Party to power he was banished to Peru. He returned in 1842, after an absence of five years, and thereupon retired from political life.

FREIRE DE ANDRADA, dâ an-drâ'dâ, GOMES (1685-1763). A Brazilian administrator, born at Coimbra, Portugal. From 1733 until shortly before his death he was Governor and Captain-General of Rio de Janeiro, and his administration finally extended also to the other provinces of Brazil. He contributed greatly to the development of the mining interests of the country and was an active promoter of colonization. The war over the boundaries of Brazil and Paraguay was fought during his administration (1754-56). As the greatest colonial governor of Brazil, his achievements have been celebrated in the epic poem entitled *Epicos Brasileiros* (2d ed. under the title *O Uruguay*, 1811), by José Basilio da Gama.

FREISCHÜTZ, frî'shûts (Ger., free shooter). A legendary hunter who enters into compact with the devil that six balls from his gun shall follow his own will, but the seventh the devil's. The idea was general in the fourteenth and fif-

teenth centuries and especially during the Thirty Years' War. It emerged in literature in Apel's *Gespensterbuch* (1810-15), and as adapted to Weber's opera, *Der Freischütz* (1821), is universally known.

FREISING, frî'zing. A town of Upper Bavaria, situated on the Isar, about 22 miles north-east of Munich (Map: Germany, D 4). It is supposed to be of Roman origin, and has an interesting Romanesque cathedral, built at the end of the twelfth century and restored at the beginning of the eighteenth, with two towers and a curious quadruple crypt. The former episcopal palace is now occupied by a clerical seminary. The historian Otto von Freising was bishop here from 1137 to 1158. There are a theological lyceum, a gymnasium, and a number of benevolent institutions. The chief manufactures are mill and other machinery, pottery, and stained glass. The town was the capital of the Bishopric of Freising, which was founded in 724 and united in 1803 to the Bishopric of Munich. Population, in 1890, 9,485; in 1900, 10,092.

FREJES, frâ'hês, FRANCISCO (?-1845). A Mexican historian. He was born in Guadalajara, was educated for the priesthood, and became a Franciscan monk. He became widely known as a pulpit orator, but left the pulpit to pursue his historical studies. For this purpose he entered the Convent of Guadalupe, in Zacatecas, and he became its superior in 1838. His most valuable work was his *Historia breve de la conquista de los estados independientes del imperio mejicano* (new ed. 1878). He also wrote *Memoria histórica de los sucesos más notables de la conquista particular de Jalisco por los Españoles* (1842).

FRÉJUS, frâ'zhûs' (Lat. *Forum Julii*). A town in the Department of Var, France, situated 15 miles southeast of Draguignan (Map: France, N 8). It was originally settled from Marseilles, and was afterwards colonized anew by Julius Cæsar, and called Forum Julii. It has numerous important Roman remains, including walls, a pharos, a circus, and a viaduct. Augustus made the harbor, which is now silted up, the most important naval station in Gaul. Among its long list of native celebrities are Agricola the general, Roscius the actor, Cornelius Gallus the poet, the Abbé Sieyès, etc. Population, in 1901, 4,156.

FREKI. See GERI AND FREKI.

FRELINGHUYSEN, frê'ling-hî'zen, FREDERICK (1753-1804). An American lawyer and soldier. He was born in Somerset County, N. J., graduated at Princeton in 1770, studied law, and was admitted to the bar in 1774. In 1775 he was elected to the Provincial Congress of New Jersey, and at the outbreak of hostilities became a member of the Committee of Public Safety. He was elected again in the year following, and when that body resolved itself into a constitutional convention, he took an active part in drawing up the new Constitution. He was a major in the 'Minute Men' organization early in 1776, and on the dissolution of these forces recruited and became captain of one of the detachments of artillery authorized by the State Legislature, and known as the 'Eastern Artillery Company.' He participated in the battle of Trenton, and it is said to have been a shot from his pistol that mortally wounded Colonel Rahl, the Hessian commander. Early in 1777 he was made colonel of New York militia, and took part in all the military operations of

Washington's army in that year, and in the battle of Monmouth, in June, 1778. In 1778-79 and again in 1782-83, he was a member of the Continental Congress. During the next ten years he practiced his profession, attaining great eminence, and from 1793 to 1796 he was a United States Senator. In 1794, during the Whisky Insurrection, he served as a major-general of the New Jersey militia, called out by President Washington.

FRELINGHUYSEN, FREDERICK THEODORE (1817-85). An American lawyer and political leader. He was born in Millstone, N. J., graduated at Rutgers College in 1836, studied law in the office of his uncle, Theodore Frelinghuysen, at Newark, and on the acceptance by the latter of the office of chancellor of the University of the City of New York in 1839, though but twenty-two years old, succeeded to his large practice. He rose rapidly in his profession, was city attorney of Newark in 1849, and became widely known as a counsel of many important corporations, among them the Central Railroad of New Jersey and the Morris and Essex Canal Company. He was originally a Whig in politics, but was one of the founders of the Republican Party in New Jersey. In 1861 he was a delegate from New Jersey to the Peace Congress at Washington, and in the same year became Attorney-General of the State, serving until 1866. In the latter year he was appointed by Governor Ward a United States Senator, to fill the vacancy caused by the death of William Wright. In the year following his appointment was confirmed by the Legislature, and he served out the remainder of Senator Wright's term, which expired in 1869, achieving a reputation as an able debater. In 1870 he was appointed by President Grant to succeed John Lothrop Motley as Minister to Germany, but declined the appointment after he had been confirmed by the Senate. In 1871 he was elected to the United States Senate. After the disputed election of 1876 he was one of the framers of the bill creating the Electoral Commission, and after the commission was constituted, in 1877, served as one of its members. After several years spent in the active practice of his profession, he again entered political life (in December, 1881) as the successor of James G. Blaine as Secretary of State in President Arthur's Cabinet. He died in May, 1885.

FRELINGHUYSEN, THEODORE (1787-1862). An American legislator and educator, the son of Gen. Frederick Frelinghuysen (q.v.). He was born at Millstone, N. J., graduated at Princeton in 1804, was admitted to the bar in 1808, raised and commanded a company of volunteers in the War of 1812, and from 1817 to 1829 was Attorney-General of New Jersey. In 1828 he was elected to the United States Senate, where he was prominent as a debater on the Whig side, taking an especially active part in the discussions over the re-chartering of the United States Bank and the withdrawing of the Government deposits therefrom, and over the tariff; but, failing of re-election in 1835, he resumed the practice of his profession in Newark, N. J., of which city he was Mayor in 1837 and 1838. He was chancellor of the University of the City of New York from 1839 to 1850; was the Whig candidate for the Vice-Presidency on the ticket with Henry Clay in 1844; and was president of Rutgers College from 1850 until his death. Consult Chambers, *Life of Theodore Frelinghuysen* (1863).

FRELINGHUYSEN, THEODORE JACOBUS (1691-1747). An American clergyman. He was born in West Friesland, and, after holding a pastorate there, came to America and settled in New Jersey as a missionary of the Reformed Dutch Church (1720). He became widely known as an eloquent preacher and was elected a delegate to the first convention of the Reformed Dutch Church, held in New York. Several of his sermons, delivered in Dutch, were published at Utrecht, where they were most favorably received; others, translated into English by William Demarest, with a biographical sketch, were published in 1856.

FREMANTLE. The chief seaport of Western Australia, at the mouth of the Swan River, 12 miles southwest of Perth (Map: Australia, B 5). It has a fine modern town hall with a lofty clock-tower, a handsome Anglican church, hospital, insane asylum, and a literary institute with loan library. Extensive harbor works are in progress. The town is divided into three districts; population, in 1901: Fremantle, 14,623; Fremantle East, 2489; Fremantle North, 3247.

FREMANTLE, WILLIAM HENRY (1831—). An English clergyman. He was educated at Balliol College, Oxford; was fellow of All Souls from 1854 to 1864; was ordained in 1855; was selected preacher at Oxford in 1879-80, and Bampton lecturer in 1883. From 1883 to 1894 he was fellow and tutor in theology at Balliol. He was Canon of Canterbury in 1882-95, and was appointed Dean of Ripon in the latter year. His works include: *The Ecclesiastical Judgments of the Privy Council* (1865, with G. C. Brodrick); *The Gospel of the Secular Life* (1882); and *Church Reform* (1887).

FRÉMIET, frā'myā', EMMANUEL (1824—). A French sculptor, born in Paris. He was the nephew and pupil of Rude. In 1843 he exhibited his "Gazelle." This was followed by a group of animal studies, of which "The Mother Cat," "A Wounded Dog," and a "Group of Dogs," were bought by the State. In 1850 his "Wounded Bear" made a great sensation. From this time he exhibited constantly, and also contributed illustrations of birds and beasts to various magazines, and did a number of paintings in the same genre. In 1875 he succeeded Barye as professor of drawing and modeling at the Jardin des Plantes. His celebrated "Gorilla Carrying Off the Body of a Woman" was refused at the Salon of 1859, but afterwards he received the medal of honor (1877) for this powerful, if repulsive, piece. His works are very numerous. His figure pieces are often monumental and of great dignity. Many critics consider him superior to Barye in his animal studies; and his originality, his knowledge of anatomy, and the power and realism of all his work are unquestioned. Other statues and groups are the graceful, spirited "Faun," in the Luxembourg; "Jeanne d'Arc," his masterpiece, in the Place des Pyramides, Paris; "The Man of the Stone Age"; equestrian statues of Napoleon I., at Grenoble, the Duke of Orleans, the Prince of Condé; the colossal elephant of the Trocadéro Fountain, Paris; "A Mounted Torch-Bearer of the Fifteenth Century"; "Velazquez on Horseback," and the statue of Lesseps at Suez (1899). He received the decoration of the Legion of Honor in 1878.

FREMONT. A city and the county-seat of Dodge County, Neb., 37 miles northwest of

Omaha; on the Union Pacific and a branch of the Chicago and Northwestern railroads (Map: Nebraska, H 2). It has important dairying and live-stock interests, machine-shops, flouring-mills, planing-mills, and other industrial establishments; and is the seat of the Fremont Normal School. Settled in 1857, Fremont was incorporated in 1871, and is governed under a revised charter of 1901, which provides for a mayor, chosen every two years, and a city council, one-half of whose members are elected at large and the remainder by wards. The city owns and operates its water-works and electric-light plant. Population, in 1890, 6747; in 1900, 7241.

FREMONT. A city and the county-seat of Sandusky County, Ohio, 30 miles southeast of Toledo; on the Sandusky River, and on the Lake Shore and Michigan Southern, the Lake Erie and Western, and other railroads (Map: Ohio, D 3). The city is at the head of steam navigation on the river, is the centre of a fertile agricultural region and of productive oil and natural-gas fields, and has manufactures of electro-carbons, engines and boilers, agricultural implements, shears, cutlery, underwear, beet-sugar, sash, doors, and blinds, etc. There are several public parks, and the Birchard Public Library, founded and endowed in 1873, by Sardis Birchard, uncle of ex-President Hayes. Spiegel Grove, the home of ex-President Hayes, is still occupied by his heirs. Population, in 1890, 7141; in 1900, 8439. A trading post, probably temporary, was established here in 1785, and a fort, called Fort Stephenson, was erected early in 1812. A popular rendezvous of the Indian tribes, Fremont was known as Lower Sandusky until 1850, when its present name was adopted in honor of J. C. Frémont. On August 2, 1813, Major George Groghan, with 150 men, was attacked here by General Proctor at the head of 400 English and 300 Indians. The latter were repulsed with the loss of 94 killed and wounded, while of the Americans only one man was killed and seven wounded. Consult Howe, *Historical Collections of Ohio* (3 vols., Columbus, 1889-91).

FRÉMONT, JOHN CHARLES (1813-90). A distinguished American explorer and soldier, the son of a French emigrant to America. He was born in Savannah, Ga., January 21, 1813, and was educated in Charleston College, from which he received a degree in 1836. Soon afterwards he passed the necessary examination, and was appointed professor of mathematics in the United States Navy. In 1838 he was commissioned second lieutenant in the topographical engineers. In October, 1841, he married Jessie, the second daughter of Senator Thomas H. Benton (q.v.). In 1842 a geographical survey of all the territories of the United States was proposed by him, and, although his idea was not entirely carried out, he was sent at the head of a party of twenty-eight men to explore the Rocky Mountains. In his accomplishment of this task he reached the Wind River Mountains, and ascended the highest peak, later known as Frémont's Peak—13,570 feet above sea-level. His next enterprise was the exploration of the territory between the Rocky Mountains and the Pacific Coast, a region then almost unknown. Early in 1843 he started with thirty-nine men, and after a journey of 1700 miles, came to Great Salt Lake. Thence he proceeded northward to the tributaries of the Columbia River, following the valley to Fort Van-

couver. In November he started upon his return, but finding himself and party in danger of death from cold and starvation, he turned westward, and after great hardship succeeded in crossing the Sierra Nevada Mountains, and in March reached Sutter's Fort in California, not far from the place where four years later gold was discovered. He returned safely by a more southerly route, reaching Kansas in July, 1844.

In 1845 Frémont went on another exploring expedition, his last under direction of the Government, spending the summer along the continental divide, and in the winter again crossing the Sierras. He asked permission of the Mexican authorities at Monterey to continue his explorations, but they refused and ordered him to leave the country. War between Mexico and the United States was then imminent, and the authorities seemed to have been fearful of Frémont's influence upon the inhabitants of California, many of whom were Americans. Frémont, refusing to leave, fortified himself and his sixty-four men on a small mountain about thirty miles from Monterey; but when the Mexicans prepared to besiege the place, he retired and proceeded to Oregon. Near Klamath Lake he was overtaken by a courier, Lieutenant Gillespie, who had been sent by the Government with a secret message to its agent in California, and who seems to have instructed Frémont, on behalf of the Administration, to coöperate in its plan for the peaceable acquisition of California. Over the exact nature of these instructions, however, there has been much controversy. Frémont immediately returned to California; but, instead of conciliating the native Californians and encouraging them to remain neutral in case of war with Mexico, he seems to have fomented a revolt, known as the 'Bear Flag War.' Sonoma was captured and independence decided upon; but when it became known that the United States was at war with Mexico and that Commodore Sloat had seized Monterey, the American flag supplanted the Bear flag. Frémont then coöperated with Commodore Stockton in establishing the power of the United States in California, and was by him made military commandant and civil Governor. Toward the end of this year (1846), General Kearny arrived with a force of dragoons. Both he and Stockton had orders to establish a government; and friction immediately ensued.

Frémont prepared to obey Stockton, and continued as Governor in defiance of Kearny's orders. For this he was tried by court-martial at Washington, the trial lasting from November 2, 1847, to January 31, 1848, was convicted of 'mutiny,' 'disobedience of the lawful command of a superior officer,' and 'conduct to the prejudice of good order and military discipline,' and was sentenced to dismissal from the service. President Polk approved of the conviction for disobedience, but remitted the penalty, and Frémont resigned.

In October, 1848, with a party of thirty-three, Frémont started on an independent overland journey in search of a practical route to California by way of the Rio Grande. His guide lost the trail in the Rocky Mountains, and, after untold sufferings, the surviving members of the party were obliged to retreat to the Rio Grande. From there Frémont proceeded to California by the Gila route, reaching Sacramento in the spring of 1849. He then settled in California, and from September, 1850, to March, 1851, represented

the State in the United States Senate. Still faithful to the route he had attempted in 1848, in 1853 he made his fifth and last exploration, crossing the Rockies and again succeeding in reaching California. In these last two expeditions his father-in-law, Senator Benton, was interested, and the discovery of practical routes for highways or railroads was the object of the explorations.

In 1856 the Republicans nominated Frémont for the Presidency. His nomination was due to his availability, to the renown gained by his explorations, and to his known opposition to the extension of slavery. In the ensuing election he met with defeat, receiving only 114 electoral votes, while Buchanan received 174. Soon after the outbreak of the Civil War Frémont was appointed major-general, and was placed in command of the Western Department, with headquarters at Saint Louis. On August 30, 1861, he issued a proclamation confiscating the property "of all persons in the State of Missouri who shall take up arms against the United States, or who shall be directly proved to have taken an active part with their enemies in the field," and freeing all slaves of such persons. Soon afterwards he established 'a bureau of abolition' to carry out the order respecting manumission. This ill-advised action greatly embarrassed the Administration, and on September 11 President Lincoln annulled the order as unauthorized and premature. Frémont's total incapacity for the command of a department soon became evident, and, acting upon the report of Secretary of War Cameron and Adjutant-General Thomas, whom he had commissioned to make an investigation, President Lincoln removed him from command in November. A few months later, however, Frémont was placed in command of the Mountain Department of Virginia, Tennessee, and Kentucky. After the battle at Cross Keys, June 8, 1862, he declined to serve, on the ground that he outranked General Pope, who was then in command of the Army of Virginia. On May 31, 1864, he was nominated for the Presidency by a small faction of the Republican Party, constituted in great part of members of the Radical wing. Finding but a slender support, he withdrew his name in September. He subsequently became interested in the construction of railroads, and in 1873 was prosecuted by the French Government for alleged participation in the swindles connected with the proposed trans-continental railway from Norfolk to San Francisco, and was sentenced on default to fine and imprisonment. He was Governor of Arizona from 1878 to 1882, and was appointed a major-general on the retired list by act of Congress in 1890. He died July 13, 1890. Consult: Frémont, *Memoirs of My Life, Including Five Journeys of Western Exploration* (Chicago, 1887); Mrs. Frémont, *Souvenirs of My Time* (Boston, 1887); Campaign *Memoirs* by Bigelow (New York, 1856) and Upham (Boston, 1856).

FRÉMONT, frâ'môn', JULES JOSEPH TASCHEREAU (1855—). A Canadian author, born in Quebec, appointed professor of civil law in Laval University in 1893. From 1891 to 1896 he was a member of the Dominion Parliament. His publications include *Le divorce et la séparation de corps*, and a *Compendium of the Dominion Laws of Canada*.

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FRÉMY, frâ'mé', EDMOND (1814-94). A French chemist, born in Versailles. He became professor of chemistry at the Polytechnic School, Paris, in 1846. In 1864 he founded, with Chevreul, a free laboratory at the Museum of Natural Sciences, of which institution he became director in 1879. His researches extended to almost every branch of chemistry. In addition to numerous treatises in the *Annales de Chimie et de Physique*, he published *Traité de chimie générale* (7 vols., 3d ed. 1862-65). The *Encyclopédie Chimique*, a work in 10 volumes, upon which he was engaged for thirteen years, was prepared by him in collaboration with several distinguished scientists, and was completed in 1894.

FRENCH, ALICE (1850—). An American novelist, better known as OCTAVE THANET. She was born at Andover, Mass., and began her literary career, about 1878, with studies of a social and economic bent, but soon turned to short stories, in which she achieved much success, especially after her removal to the West, Iowa and Arkansas, gave her opportunities for exploiting regions hitherto little attempted in fiction. Noteworthy among her stories are *The Bishop's Vagabond* (1884), *Whitsun Harp*, *The Regulator*, and *The Mortgage on Jeffy*. *Knitters in the Sun*, a collection of stories (1887), *Otto the Knight*, and other trans-Mississippi stories (1891), *A Book of True Lovers*, and *Stories of a Western Town* (1893), are volumes characteristic of her work in this field. A longer novel, *Expiation* (1890), won, and deserved, high praise for its nervous vitality, truth to life, and vivid local color. *We All* (1891) is a story for children. "Octave Thanet" has also edited *The Best Letters of Mary Wortley Montague*.

FRENCH, DANIEL CHESTER (1850—). An eminent American sculptor, born at Exeter, New Hampshire, April 20, 1850. In 1867 his father, who was a judge in the New Hampshire courts, moved with his family to Concord, Massachusetts. He studied for a year at the Massachusetts Institute of Technology, and in 1869 worked for a month in the studio of J. Q. A. Ward. In 1873 he made for the town of Concord the earliest and one of the cleverest of his more important works, the "Minute Man," and upon its completion went to Florence, where he spent a year with the American sculptor Thomas Ball. In 1876 French opened a studio in Washington; from 1878 to 1887 he made Boston and Concord his headquarters, and in the latter year settled in New York. Meanwhile, he had made frequent visits to Paris, but although he absorbed whatever appealed to him most, he does not seem to have come directly under the influence of any one French master.

French is a sculptor of great versatility, and the catalogue of his works is large. His "John Harvard" (1882) is in the severe, simple style of the "Minute Man." His busts of Emerson and Alcott are in the firm close modeling of his earlier years, and are characterized by the lofty intellectual quality which he so often shows in his portraiture. The marble statue of Lewis Cass in the Rotunda of the Capitol (1888) in Washington is more loosely handled than the two former works, but is large and strong. In the Gallaudet Monument in Washington, where the little girl is studying intently the deaf-mute

language with its inventor, Gallaudet, French first introduces the element of pathos which has become so familiar in his later works. Perhaps the most interesting is his relief, "Death and the Sculptor," for the monument of Milmore, which was exhibited at the Chicago Exposition of 1893. Of the large amount of decorative sculpture which was done by French, or under his direction, at this World's Fair, the most noteworthy were the many groups of animals. The great gilded statue of the Republic, which French placed in the Court of Honor, is perhaps the most striking colossal statue of recent times. His other work includes the monument to John Boyle O'Reilly in the Back Bay Fens of Boston (1895); the statues of Starr King in San Francisco, and of Rufus Choate in Boston; and the two fine statues, "History" and "Herodotus," for the Congressional Library in Washington. With the assistance of Potter he made an equestrian statue of General Grant, in Fairmount Park, Philadelphia (1899), and one of Washington for the United States Building in the Paris Exposition (1900). Among his most recent works are: the Hunt Memorial in Central Park, New York; the bronze doors of the Boston Public Library; and a large amount of decorative work for the Minnesota State House. His Milmore Memorial received a third-class medal at the Paris Salon of 1892, and at the Exposition of 1900 he was awarded a medal of honor. He was elected a member of the Society of American Artists; of the National Sculpture Society; and associate of the National Academy of Design.

FRENCH, JOHN DENTON PINKSTONE (1852—). A British soldier, born at Ripple Vale, Ripple, Kent. He served in the Royal Navy in 1866-67, entered the army in 1874, served with the Nineteenth Hussars in the Sudan campaign of 1884-85, and commanded that regiment in 1889-93. From 1893 to 1894 he was assistant adjutant-general of cavalry on the staff, and from 1895 to 1897 was assistant adjutant-general at army headquarters. He was promoted to the command of the Second Cavalry Brigade in 1897, and appointed major-general in command of the cavalry division in Natal in 1899. In 1900 he became lieutenant-general (local) commanding the cavalry division in South Africa. He directed the operations about Colesberg (November 10, 1899, to January 31, 1900); was in command of the cavalry in the operations terminating in the relief of Kimberley (February, 1900), and of the cavalry division of Lord Roberts's army in the operations leading to the capture of Bloemfontein and Pretoria. He also commanded Lord Roberts's left wing in the various battles east of Pretoria. For his services he was promoted to be major-general, and appointed to the command of the First Army Corps at Aldershot.

FRENCH, MANSFIELD (1810-76). An American educator. He was born at Manchester, Vt., and was educated at Burlington (Vt.) Seminary, and at the Divinity School of Kenyon College, Ohio. He was one of the founders of Marietta College, in 1835. In 1845 he joined the Methodist Episcopal Church, and from 1845 to 1848 was president of the Xenia (Ohio) Female College. He took an active part in the movement that led to the founding of Wilberforce University, the first college for negroes in America. In 1858 he became editor of *The Beauty of Holiness*, a

religious paper published in New York City. He was an ardent abolitionist, and at the outbreak of the Civil War made a study of the negro question with a view to preparing for the emancipation of the slaves. With an idea that the solution of the problem was to be found in education, he laid before President Lincoln his views. In February, 1862, he organized an immense mass meeting in Cooper Union, New York City, where his plans were explained and the organization of the National Freedmen's Relief Association followed. Of this association he became general agent, and proceeded to Port Royal, S. C., with a large corps of teachers and assistants, where, in spite of opposition from both civil and military authorities, his work among the negroes was crowned with considerable success.

FRENCH, WILLIAM HENRY (1815-81). An American soldier. He was born in Baltimore, Md., graduated at West Point in 1837, was assigned as second lieutenant to the First Artillery, served in the Florida War of 1837-38, and was engaged on frontier duty until 1847. In the Mexican War he served in the Southern campaign, for part of the time as aide-de-camp to General Pierce, and was brevetted. On September 22, 1848, he was promoted to be captain, and between this time and 1861 was stationed successively at Fort Monroe, Fort McHenry, Fort Clark (Tex.), and Fort Duncan (Tex.). In September, 1861, after the outbreak of the Civil War, he was promoted to be a brigadier-general of volunteers, and, in October, to be a major in the Second Artillery. He served throughout the Peninsular campaign, earning the brevet of lieutenant-colonel; participated in the Maryland campaign, and earned the brevet of colonel; was promoted to be major-general of volunteers in November, 1862; served in the battles of Fredericksburg and Chancellorsville; and subsequently commanded the Third Army Corps in various minor engagements. On May 6, 1864, he was mustered out of the volunteer service, and on March 13, 1865, he was brevetted major-general in the Regular Army. After the close of the war he served as a member of various boards, was several times detailed for inspection duty, was promoted to be colonel in July, 1877, was in command of the troops engaged in the suppression of the Baltimore and Ohio Railroad riots, July 18-24, 1877, and on July 1, 1880, was retired from active service.

FRENCH AND INDIAN WAR. The name usually given to the struggle in America between the French and English (1754 to 1760), roughly coincident with the 'Seven Years' War' in Europe. The French, being in possession of Canada and Louisiana, reinforced their establishments on the banks of the Saint Lawrence and near the mouth of the Mississippi, and attempted, by the occupation of various points in the interior with a line of military posts and of protected trading posts, to confine the English to a strip of territory on the Atlantic coast, while they themselves planned to occupy both the land of the Ohio basin and that surrounding the Great Lakes. The territory in dispute, and especially that watered by the Ohio, was claimed by both France and England, the French resting their claims largely upon the alleged effect on the ownership of an entire river basin of a settlement at the river's mouth, and the English insisting that

their King's grants of land 'from sea to sea' became literally effective and valid when the coast-line was permanently occupied. No permanent settlements had been made in the territory thus claimed by both, although a small settlement of Virginians was established on the Monongahela, and settlements in Ohio were in contemplation. The Governor of Virginia had organized a provincial force to protect the western frontier, and hostilities began in May, 1754, with an attack made by Washington on a French force under Jumonville. In 1755 an army of regulars, under General Braddock, acting with a detachment of Virginia troops, undertook an expedition for the capture of Fort Duquesne, which the French had built at the junction of the Monongahela and the Allegheny. This force was disastrously defeated, July 9, 1755, and the French retained full control of the frontier. Being enabled to operate on an 'inner line' of communication, while the English were obliged to conduct a series of isolated and unrelated campaigns, the French maintained their advantage until the summer of 1758, when they inflicted a great defeat upon the British in the battle of Ticonderoga, July 8th, their last important success. The fortune of war now turned. Largely as a result of a more energetic policy introduced by the Pitt Administration, the English campaigns were prosecuted more vigorously, and resulted in the capture of Louisburg (July, 1758), of Fort Frontenac, on Lake Ontario (August, 1758), and of Fort Duquesne (November, 1758). The French line of defense and of communication was thus broken; and this success was made secure in the following summer by the capture of Ticonderoga, Crown Point, and Fort Niagara. Finally, on September 13, 1759, the forces of General Wolfe defeated the army of Montcalm which was defending Quebec, whose surrender followed, and in September, 1760, control was gained of Montreal and the rest of Canada. Peace was not made until the Seven Years' War (q.v.) on the Continent was concluded; and in the Treaty of Paris, of 1763, France ceded Canada to England, and England received from Spain the Floridas, which she retained until 1783, while Spain received Louisiana from France. Thus France lost her possessions on the American continent. Consult: Winsor, *The Mississippi Basin* (Boston, 1895); Parkman, *Montcalm and Wolfe* (Boston, 1884); Sargent, *History of an Expedition Against Fort Duquesne, 1775*, edited from original manuscripts (Philadelphia, 1856); Casgrain, *Montcalm et Lévis* (Tours, 1898); Doughty and Parmlee, *The Siege of Quebec and the Battle of the Plains of Abraham* (6 vols., Quebec, 1901); and Bradley, *Fight with France for North America* (New York, 1902).

FRENCH BROAD. A river rising in the Blue Ridge Mountains, in western North Carolina (Map: North Carolina, B 4). It flows northwest and then west, and joining the Holston River 3 miles above Knoxville, Tenn., forms the Tennessee River (q.v.). It is over 200 miles long, and flows through a country famed for its scenery. The chief town in its course is Asheville, N. C.

FRENCH CHALK. See CRAYON.

FRENCH CON'GO. A possession of France in Western Equatorial Africa, bounded on the

north by Wadai, on the east and south by Egyptian Sudan, the Congo Free State, and Angola, and on the west by the Atlantic Ocean, the Spanish colony Rio Muni, Kamerun, and Nigeria (Map: Congo, B 2). It reaches Lake Chad and the Bahr-el-Ghazal in the north. The Congo and Ubangi rivers border it on the southeast. The area is about 450,000 square miles. The coast is diversified by several bays and many lagoons. The interior is but partly explored. It is mountainous in the south, with elevations reaching 3600 feet; the river valleys are numerous, extensive, and very fertile. The Gabun, Ogouai, Sanga, Lalli, and Licona are among the important rivers, some of which may be classed as navigable streams. The fauna includes the buffalo, leopard, rhinoceros, and crocodile; and the home of the chimpanzee and gorilla is found here. The French Congo is one of the most promising of African colonies, although the climate is unhealthful for Europeans. The forests are valuable, and rubber is a prominent product. There are mineral resources of gold and iron; also some copper. Manioc is raised by the natives, and coffee, vanilla, etc., are grown by Europeans. The exports are chiefly rubber, ivory, and costly woods. Some of the other exports are coffee, cocoa, palm oil, and piassava. In 1900 the exports amounted to \$1,457,000. The imports for 1900 were \$2,050,000. Almost 40 per cent. of the total commerce is with France and French colonies. Ninety-nine vessels, of 137,698 tons, entered the ports in 1900, mostly at Loango, which has the only good harbor.

The country is administered by a Commissioner-General and an Administrative Council. The upper regions along the Congo and Ubangi rivers are, however, under military control, and are known as the Military Territory of the Countries and Protectorate of the Shari. The local budget of 1900 balanced at about \$740,000. A loan of nearly \$400,000 was authorized for the construction of roads, telegraphs, and other public improvements. In the French budget of 1902 the Congo called for \$100,000. The transportation and communication facilities are very meagre. A telegraph line connects Brazzaville, Loango, and the English Atlantic cable. The population is estimated at from 8,000,000 to 15,000,000, including the Fan, Bakalai, Mpongwe, and several other important and interesting races or tribes. The capital is Libreville, with about 3000 inhabitants. Loango, Franceville, and Brazzaville are also noteworthy towns. There are 56 schools for boys and girls, and over 2500 scholars.

The coast of French Congo was discovered by the Portuguese in 1470. In 1841 the French established a footing on the Gabun River, and actively began operations. Libreville was founded in 1840. In 1862 Cape Lopez was acquired, and the French were then in possession of the coast for 200 miles. Explorations and military expeditions extended the French rule northeast until, by a series of conventions beginning in 1885 with European powers, the present limits of the French Congo were fixed. Consult: Dutreuil de Rhins, *Le Congo français* (Paris, 1885); Payeur-Didelot, *Trente mois au continent mystérieux. Gabon-Congo, etc.* (ib., 1900); Guillemot, *Notice sur le Congo français* (ib., 1900).

FRENCH CREEK. A stream in Jefferson County, N. Y., emptying into the Saint Law-

rence. On November 1 and 2, 1813, a small American force, under General Brown, intrenched on its banks near the site of the present Clayton, N. Y., repelled, with the loss of only two men killed and four wounded, an attack of twelve British vessels, which suffered severely in the engagement.

FRENCH FURY, THE. A name given to the attack made by the Duke of Anjou on Antwerp on January 17, 1583. The attempt was repelled, and all of the assaulting force were killed or captured.

FRENCH GUIANA. See GUIANA.

FRENCH GUINEA, gin'è. A French possession in West Africa, bordered by Portuguese Guinea and by Senegal on the north, the Military Territories of French Sudan on the east, Sierra Leone, Liberia, and the Ivory Coast on the south, and the Atlantic Ocean on the west (Map: Africa, C 3). French Guinea extends on the north to the towns of Kedugu and Birgo, and includes in the east the territories of Dinguiray, Sigui, Kurrussa, Kantan, Kissidugu, and Beyla, the river Sankarani forming the eastern border. The area is about 95,000 square miles, embracing Futa-Jallon (q.v.). The coast region was known as Rivières du Sud before 1893. French Guinea is largely a mountainous country, with a rather favorable climate, and some fine forests. The coast streams are numerous. The Manea and Dubreka rivers empty into the ocean near Konakry. The country produces millet, rice, rubber, gum, and palm-kernels. In Futa-Jallon, coffee, rice, cotton, etc., are raised, and there are minerals and large herds of cattle. Several manufacturing establishments, mainly French, are situated in Konakry. In 1900 the imports of French Guinea were \$2,755,200, about one-tenth being from France; the exports were \$1,887,500, of which about one-fourth went to France. Cotton goods were the main import (nearly one-third); and by far the leading export was rubber, with cattle and palm-kernels ranking second and third, respectively, on the list. The commerce of the country is rapidly increasing. In 1899, 5002 vessels of 308,523 tons cleared the ports. French, English, and German steamers regularly visit Konakry, from which port a railway is building to the Niger to attract trade from Timbuktu. Sigu Sikora, and other interior points. There is a telegraph line from Konakry to Boké and thence to Kankilifa.

French Guinea is divided into administrative circles, and is administered by a Governor (who is under the Governor-General of French West Africa, q.v.), and by a local council of six members, three chosen from the Government officials, and three from the leading citizens. Futa-Jallon has, to some extent, a separate administration. The local budget of French Guinea balanced at \$1,330,800 in 1901. The financial condition of the colony is good. In all the foregoing statistics Futa-Jallon is included, as well as in the population of the country, which is given at 2,200,000. The capital, Konakry, on the island of Tombo, is the chief city, and is newly built. It is connected with the mainland by a bridge. Other noteworthy towns are Boké, Ubréka, and Timbo. There were seven schools in the country in 1897.

The coast of French Guinea was known to

Portuguese explorers at an early date. In the first part of the seventeenth century French merchants began trading in parts of the country, and in 1685 the Compagnie de Guinée obtained from Louis XIV. exclusive commercial privileges for a large part of the West African coast, and the region was embraced in a general way in the French 'pacte colonial.' The littoral portion, called Rivières du Sud, was taken possession of outright by France during the period from 1854 to 1869. The French, in 1884-85, obtained a footing in Bure, and forced the Almani rulers of Futa-Jallon and neighboring districts on the east to a treaty of peace in 1887. A stubborn contest was next undertaken with Samori and his newly founded kingdom of Wassulu, on the southern headstreams of the Niger, northeast of Liberia. In February, 1891, at Kantan, on the Milo, he was defeated and driven out of Bissandugu, Sanakoro, and Keruane, and his followers, the Sofa, were scattered. Consult Aspe-Fleurimont, *La Guinée française* (Paris, 1900).

FRENCH HORN. A name assigned to the horn formerly much used in the full orchestra. It has a range from B₂ to f², but the four tones at either extreme are difficult and seldom used. See HORN.

FRENCH INDO-CHINA. The general name for the French possessions in Southeast Asia, to wit, the colony of Cochin-China, and the protectorates of Tongking, Laos, Annam, and Cambodia. (For more particular information, see these different headings.) French Indo-China is bounded by China on the north; the China Sea on the east and south; the Gulf of Siam on the southwest; and the Mekong River on the west, beyond which lies Siam. The estimated area and population of French Indo-China in 1900 are given as follows:

	Area in sq. miles	Population
Tongking.....	46,000	7,000,000
Annam.....	50,000	5,000,000
Laos.....	98,400	605,000
Cambodia.....	38,600	1,500,000
Cochin-China.....	22,000	2,270,000
	255,000	16,375,000

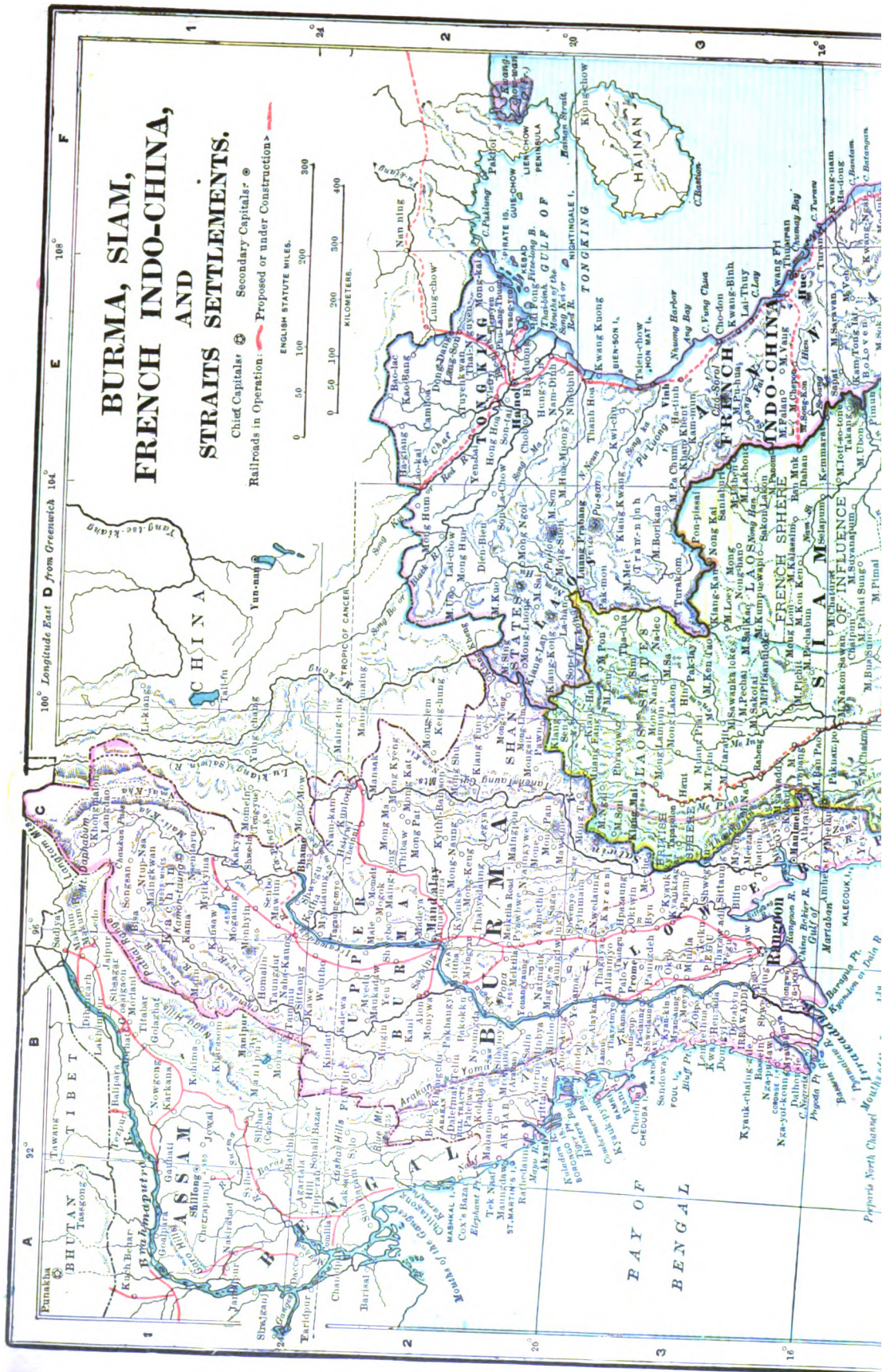
The French emigration to Indo-China is very small, but the Republic is actively engaged in organizing the affairs and improving the commercial and industrial conditions of the country. At the head of the French administration is the Governor-General, with his seat in Saigon, under whom are the Governor of Cochin-China and the Resident Superiors of the four protectorates. Kwang-Chi-Wan, on the China coast, is also since 1900 a political part of Indo-China, having been leased from China. Since 1887 a customs union has united these various possessions. In 1900 the imports were valued at \$37,200,000, the exports at \$31,200,000. The local revenues for Indo-China for 1902 were estimated, in piastres, at 27,142,000, and the expenditures at 27,128,000. The budget is maintained chiefly by receipts from Government monopolies, customs, railways, telegraphs, and posts, and provides for the military and judiciary systems, the public works, etc., of the whole country. The expenditures of the Republic (budget of 1902)

BURMA, SIAM, FRENCH INDO-CHINA, AND STRAITS SETTLEMENTS.

Chief Capitals: Ⓢ Secondary Capitals: Ⓢ
Railroads in Operation: — Proposed or under Construction: - - -

ENGLISH STATUTE MILES.
0 50 100 200 300

KILOMETERS.
0 50 100 200 300 400



for Indo-China were, approximately, \$6,800,000. The Indo-China Bank is a large institution, especially engaged in furthering local enterprises. Many lines of railway are in process of construction. The army consists of 8860 French and 14,935 native troops, all under French officers.

The beginning of French influence in South-eastern Asia may be traced to missionary efforts. These were begun in the seventeenth century in Siam, whence they spread to Tongking and Annam. A Siamese embassy appeared at the Court of Louis XIV. in 1685. In 1774 local troubles broke out in Annam, and King Gya-Long was forced to seek shelter with the French bishop in the Province of Saigon. Military aid on a large scale was promised, but the troubles in France delayed operations until 1802, when, with the assistance of the French, King Gya-Long regained his throne. His dominion extended over what is now French Indo-China. Several French officers remained in his service, and French engineers fortified the chief cities. King Gya-Long gave certain privileges to French and Spanish missionaries, but his successors were less friendly. The advisers of King Minh-man, about 1820, urged him to a policy of repression which turned into persecution. A French expedition set out against China in 1857, and the gradual conquest of the whole country began. In 1861-62 the French became masters of the principal part of Cochin-China, and about the same time they established a protectorate in Cambodia. In 1882 the Third Republic resolved upon a highly aggressive policy, and after that year, and especially after the war between Japan and China had left China in a helpless condition, the French steadily pressed their conquests until they possessed all the country east of the Mekong.

FRENCH LANGUAGE. HISTORY. The ancient inhabitants of the country now called France were the Gauls or Celts. They spoke the Celtic language, which is related to the dialect of modern lower Brittany and to the Welsh of Wales. In the first century B.C. the Romans, under the leadership of Julius Cæsar, conquered Gaul and imposed the Latin language upon its inhabitants. There were, however, two Latin languages, that of the writers and orators (*sermo urbanus*) and that of the lower classes of the people (*lingua Romana rustica*). It was the latter that was brought to Gaul by the soldiers, merchants, and colonizers. Four centuries later Latin was spoken almost everywhere in that country. Every now and then a scholar, impelled by patriotic motives, endeavors to prove that the Gauls did not give up the tongue of their ancestors, but that Latin and Celtic possess in common a number of roots, and that French can therefore just as well be traced back to Celtic. The chief difficulty in this theory is that, as we know so very little of the Celtic tongue, its characteristic features can be only vaguely conjectured; thus a direct proof of the thesis is *a priori* impossible. Moreover, Italian, Spanish, and the other Romanic languages offer such convincing examples of an evolution similar to that of Latin into French that the question may safely be considered as settled. To gain an idea of the weakness of the position of the Celtic School one need only read Marcillac, *Les vraies origines de la langue française* (Paris, 1901). On the other hand, nobody ever tried to contest the fact that the Gauls be-

queathed a certain number of words (exactly how many it is difficult to say) to the *lingua Romana rustica*, and through this medium to French. Here are a few examples:

LATIN	FRENCH	CELTIC
alauda, beccus,	alouette, bec,	? becco, whence also becquée, becqueter, bécassee, béquille.
carrus, brugaria, leuca,	char, bruyère, lleue,	cart. brug. leuga.

In the fifth century Gaul was conquered a second time by the Visigoths, Burgundians, and Franks; the last of whom, the most powerful of the Germanic nations, soon became masters of the whole country. But this time the conquerors adopted the language of the conquered, introducing into it only about four hundred Germanic words, mostly terms of war, among which may be mentioned:

LATIN	FRENCH	GERMANIC
berfredus, crapaldus, faldistollum, filtrum, mariscalus, werra,	berfroil, crapaud, fauteuil, feutre, maréchal, guerre.	berfrit. craup. falistuol. filz. marahscale. werra.

A few Greek words came into France in the sixth century through Greek colonies on the Mediterranean, especially Marseilles, Nice, and Monaco; as for instance:

LATIN	FRENCH	GREEK
bastum, byrra, colla, hemisrania,	bat, bourse, colle, migraine,	root of βαστάζειν. βύρρα. κόλλα. ἡμικρανία.

A number of other Greek vocables were introduced in subsequent periods either by the Church (*évêque, prêtre, hérétique, moine, basilique*), or by scholars for a definite scientific purpose.

Toward the beginning of the seventh century the idiom spoken in France differed enough from the lower Latin to be called a new language, the *Romanic*. The main transformations undergone by Latin were the disappearance or obscuration of the non-accented syllables in words (*hospitale* becomes *hôtel*; *rigidum, roide*; *liberare, livrer*, etc.); and the prevalence of analysis over synthesis in syntax (*Petri* becomes *de Petro*; *amavi* = *amatum habeo, habet* = *ille habet*). As early as the sixth century the historian Gregory of Tours remarks that "the scholarly language [Latin] is no longer understood except by a few people, while the rustic [Romanic] is understood by everybody." From that same time the homilies of the Church councils begin to be translated into the popular idiom. The famous 'Capitulaires' (royal edicts) of Charlemagne, in the eighth century, require the bishops to use Romanic in their sermons.

Quite early a marked difference was noticeable between the spoken languages of the northern part of France and that of the south, the dividing line extending from La Rochelle, at the mouth of the Charente, through Limoges and Clermont-Ferrand, to Grenoble. The first, which was the more important of the two, and was to become the French of to-day, was the *langue d'oïl*, while the second, which became the modern Provençal, was the *langue d'oc*. *Oïl* and *oc* were the words meaning 'yes' in the two respective

idioms. The two idioms again branched into several dialects or patois. Of those of the *langue d'oïl*, four were especially important: those of Ile de France, Normandy, Picardy, and Burgundy. The dialect of Ile de France began to prevail over the others in the twelfth century, thanks especially to the political predominance of the kings residing in Paris, who gradually succeeded in compelling allegiance on the part of the barons of the provinces. The ascendancy was complete at the end of the fourteenth century.

The *langue d'oc* also split into different dialects (Gascon, Languedocien, Auvergnat, Provençal, Savoyard, etc.). An era of brilliant literary production seemed for a moment to assure its supremacy in the future over the *langue d'oïl*. After the twelfth century, however, it declined rapidly; but it did not fall back into the condition of a 'patois' (the name given in French to languages merely spoken, not written), without contributing a certain number of terms to the *langue d'oïl*: *carguer*, *cap*, *mistral*, *corsaire*, *vergue*, *carnassier*, *jaser*, *ruser*, *fâcher*, *roder*, *malotru*, *badaud*, *forçat*, *ménestrel*, *ballade*, *pelouse*, *caisse*, etc.

During the twelfth and thirteenth centuries the French language had a great popularity in Europe, if we may trust two Italian writers of the time—Martino di Cassale and Brunetto Latini. We are even told by others that rich barons engaged the services of French-born tutors for their children. No new contribution to the vocabulary is to be mentioned at this period, except a few Arabic terms (about fifteen) brought to France by the knights who returned from the Crusades (*bazar*, *haras*, *avoine*, etc.). The fourteenth and fifteenth centuries, the epoch of the disastrous Hundred Years' War, were less brilliant. After the tenth century, when the classical Latin had fallen already into complete disuse, a tendency prevailed among more or less happily inspired scholars to introduce into the current language words taken bodily from Latin, and therefore unmodified by the natural process of transformation through the medium of lower Latin and Romanic. It happened therefore that a considerable number of Latin terms gave two French words, one of popular, the other of scholarly origin:

hospitalem,	hôtel, hôpital.
rigidum,	roide, rigide.
fragilem,	frêle, fragile.
liberare,	livrer, libérer.

These words are called *doublés*. This method of enriching the dictionary became common in the fourteenth century, and lasted through the fifteenth and the sixteenth. The Renaissance only encouraged this tendency. In the seventeenth century, however, a reaction set in, and Molière may be said to have contributed much toward putting an end to the false erudition of his contemporaries by his pitiless attacks, particularly in the amusing third 'Intermède' to the *Malade imaginaire*.

We have to record in the sixteenth century the first serious attempt to regulate the French language, to adopt grammatical rules, and to fix the vocabulary. While this was certainly a good work, one cannot but regret the loss of a great many picturesque and excellent words sacrificed to a need of order and to the fear of impropriety. Here are a few of the excluded terms:

ardoir (*brûler*), *cuidier* (*croire*), *desduit* (*plaisir*), *emmy* (*au milieu de*), *ire* (*colère*), *orée* (*bord*), *ost* (*armée*), *prou* (*beaucoup*). Some, like *dévaler* (*descendre*), *fétard* (*paresseux*), and others have remained in the colloquial vocabulary.

A formidable invasion of about five hundred Italian words during the sixteenth century was also detrimental to the language. It was due to the predominance of Italian customs at the Court as a result of the presence of Catharine de' Medici, and also to the wars in Italy. These two distinct influences brought in two distinct classes of words; the one consists of expressions borrowed from the sphere of art: *ariette*, *aquarelle*, *arcade*, *arlequin*, *artisan*, *baladin*, *balcon*, *barcarolle*, *bouffon*, *burlesque*, *buste*, *campanile*, *carnaval*, *charlatan*, *concert*, *esquisse*, *façade*, *feston*, *fugue*, *girandole*, *gouache*, *mandoline*, *opéra*, etc. The other is composed of military terms: *alarme*, *ulerte*, *arsenal*, *bastion*, *bombe*, *canon*, *caracolier*, *carrousel*, *colonel*, *cocarde*, *escalade*, *escrine*, *embuscade*, *estafette*, *estafilade*, *fantassin*, *sentinelle*, *soldat*, *timbale*, *vedette*, etc.

In the early part of the seventeenth century there was a similar Spanish invasion, and French was enriched by about one hundred words: such as *abricot*, *alcôve*, *bizarre*, *corridor*, *duègne*, *mantille*, *sieste*, etc. At the same epoch a few words came from Germany, several wars having more than once brought its inhabitants into contact with the soldiers of France: *bivouac*, *blocus*, *fifre*, *havresac*, *loustic*, *lansquenet*, *obus*, *rosse*, *tringuer*, *choucroute*, *kirsch*, *nouille*, *graver*, *valser*. The influence of the *Précieuses* (see FRENCH LITERATURE) ought not to be ignored. A few illustrations of expressions coined by them and subsequently taken up in the current language may be of interest here: *être de qualité*, *un procédé tout à fait irrégulier*, *une chose du dernier bourgeois*, *donner dans le vrai*, *avoir des lumières sur un sujet*, *avoir l'intelligence épaisse*, etc. The Académie Française, founded 1635 (see ACADEMY), has always taken a rather conservative attitude. The policy of its members has been from the beginning to record (*constater*), not to innovate. The eighteenth century is the period in which France has exerted the most remarkable influence over European civilization. The glorious reign of Louis XIV. had indirectly contributed to make French an international language. It was recognized as such not only by politicians and by the higher society in every country, but even by the scholars who used it in their books to increase the number of their readers. It was a few years after the death of Voltaire and Rousseau that the Academy of Berlin established a prize contest on the three following questions: "Qu'est-ce qui a rendu la langue française universelle? Pourquoi mérite-elle cette prérogative? Est-il à présumer qu'elle la conserve?" The enthusiastic answer of Rivarol, known as the "Discours sur l'universalité de la langue française," was crowned. The language may have increased in accuracy, clearness, and elegance during the eighteenth century, but it acquired no new qualities. It may be said that by rendering it too perfect, Voltaire robbed French of a part of its strength, of its wealth, and of its originality.

The Revolution gave birth to a number of new expressions. The Académie had been suppressed

by a decree of August 8, 1793; the 'Sections de Grammaire et de Poésie' of the Institut (founded in 1795) took provisionally its place. An edition of the *Dictionnaire* was, nevertheless, published in 1798 by the new men, and as they did not dare to introduce into it the words that had been recently coined, they put them in an appendix. Some of them have disappeared, some have remained. Among the latter are: *administratif*, *aéronaute*, *assignat*, *bureaucrate*, *carmagnole*, *centralisation*, *club* (pronounced clob), *décade*, *démoraliser*, *divorcer*, *fédéraliser*, *guillotine*, *guillotiner*, *monarchiste*, *polytechnique*, *révolutionner*, *septembriser*, *terrorisme*, etc. Most of them, as may be seen, are clumsily constructed. In the early part of the nineteenth century the Romanticists tried to bring new life into the language by adopting French words which had been given up in the course of previous periods. Victor Hugo says of himself, that he has

"tiré de l'enter
Tous les vieux mots damnés, légion sépulcrale."

This, however, was imitation of life, not life itself, and the movement soon died out, until a new and still less successful effort in the same direction was made by the poets of the Symbolist School (especially by the group of the Romanistes) in 1896. (See the *Glossaire* by Plowert—pseudonym for Paul Adam.) Two events of great importance took place in the second half of the nineteenth century. First, the cosmopolitan tendency common at this epoch to all European languages made itself felt in French. Its most noticeable result is the influx of English words: the more one advances, the more Anglo-mania seems to gain ground. All attempts to check the movement have proved vain. Endless lists of these borrowed terms have been made by scholars: *bol*, *boze*, *bouledogue*, *châle*, *chèque*, *clown*, *cabbage*, *dandy*, *drainer*, *fashionable*, *groom*, *hall*, *humour*, *lunch*, *meeting*, *plaid*, *speech*, *sport*, *square*, *tender*, *ticket*, *toast*, *touriste*, *tunnel*, *verdict*, *wagon*, *whist*, etc. The second event is the still greater invasion of scientific terms which are common to all countries: *photographie*, *télégraphe*, *téléphone*, *anémométrie*, *antalgique*, etc. This double current results naturally in a continual proportional decrease of the stock of genuine French words. The purity and the beauty of the language do not gain by it either, and Petit de Julleville's statement seems to be correct—namely, that the new terms have "déméurement grossi plutôt qu'enrichi le vocabulaire." Littré, Nodier, Jullien, Egger, Darmesteter. Brunot have raised their voices in vain in the sense of Petit de Julleville. The Académie itself can no longer resist; no less than 2200 neologisms were inserted in the seventh edition of the *Dictionnaire* in 1878.

The present state of the French language may be tabulated roughly as follows, taking as our basis the 32,000 words of the last edition of the *Dictionnaire de l'Académie*:

Of Latin stock.....	3,800
Of early Germanic origin.....	400
By derivation from primitive words (such as <i>Richard</i> , <i>erickbir</i> , from <i>riche</i> ; <i>pauvette</i> , from <i>pauvre</i>).....	7,800
Of foreign and scholarly origin.....	20,000
	32,000

Moreover, the style cannot be said to have improved. The simultaneous influences of science

and realism have dried it up, and that of the newspapers, which grows daily, is a constant source of corruption. However, a few individual writers, like Renan and Anatole France, Remy de Gourmont and Mirabeau, in the second half of the nineteenth century, as Châteaubriand at its opening, have gloriously upheld the traditions of pure and elegant French.

French is used by about forty million people. It is the language of the greatest part of France (Brittany and a few southern districts only being excepted), of part of Belgium and Switzerland, and part of Canada. In Louisiana it is fast disappearing. If, owing to the growing importance of economic interests in the world, English has become the predominant language in civilized countries, French has, nevertheless, retained a part of its prestige and is still considered the most refined among the leading idioms of the earth.

GRAMMAR AND SYNTAX. For the early period, see **ROMANCE LANGUAGES**. For a long time no uniform system of orthography existed. If one reads, for instance, the fable of "The Wolf and the Lamb," by Marie de France (thirteenth century), it will be found that within thirty-eight lines the word for lamb is spelled in six different ways, and that for wolf in four. The example of Rabelais is often quoted, who wrote the word for oil in three different ways within the space of six lines. We have seen that the regulation of the language began in the sixteenth century. At once two schools were formed disputing over the best method of spelling; one of these demanded etymological, the other phonetic orthography. As erudition was much in favor at the time, the phonetic system had to yield, and furthermore a number of useless letters were wrongly introduced under the pretext of etymology: *d* in *poids*, *b* in *devoir*, *l* in *cheval*, *veult*, and even *peult*; *diner*, which is really a contraction of *déjeuner*, was written *dipner*, as if from the Greek *δινειν*.

In the seventeenth century a number of these letters were dropped, but new attempts at phonetic spelling failed once more. Grammar and syntax at this period are still in a state of disorder. The greatest writers are at variance as to the gender of certain words; the existence of rules for the use of the partitive article and of the personal pronouns is only vaguely suspected; the comparative is occasionally used for the superlative; the participles, present and past, agree or do not agree at the will of the writer. It was, however, at that epoch that the present rules of the agreement of participles was formulated by Vaugelas, in his *Remarques sur la langue française*. Briefly, it may be said that the seventeenth century observed the logical rather than the grammatical connection of words.

In the eighteenth century the rules established during the previous period were gradually carried out, and the liberties of syntax and orthography were dropped one by one. Owing to the influence of the experimental philosophy, requiring precision of style, the sentences became gradually shorter, while the long harmonious period of the classical age fast disappeared. Already at the close of the seventeenth century, Bayle protests against this simplification of style, which he considers a degeneration. "Ils recommencent une période à chaque ligne; c'est prendre le parti le

plus facile; un paresseux s'accommode fort de cela." The Académie, in the 1742 edition of its Dictionnaire, drops a number of double letters, replaces the *s* by a circumflex before a consonant (*blâme* for *blame*), and in a few cases substitutes an *i* for the *y*. In the edition of 1762 other innovations have to be recorded—namely, the distinction of *i* and *j* and of *u* and *v*.

Voltaire had tried in vain to bring about the use of *ai* instead of *oi* in the endings of verbs, according to pronunciation, but this reform was not adopted by the Académie till the edition of 1835. Except for this change, the language of the nineteenth century has remained on the whole stationary. The last decade, however, has been an era of orthographic reforms. For a long time individual efforts in that direction, made by prominent men (Didot, Littre, and others), had remained without effect. But since 1890 societies have been organized in France, Belgium, and Switzerland in order to bring about the desired improvements. They have a special organ, *Le Réformiste*, edited by Jean Barès, who made his fortune in South America and devoted considerable sums of money to the cause. A first set of reforms has been officially introduced by the French Minister of Public Instruction in an edict of February 26, 1901. Other changes are contemplated.

PHONETICS. For early period, see ROMANCE LANGUAGES. In the sixteenth century the pronunciation of the letters was as variable as orthography. *A* and *e* were interchangeable; the same is true of *ou* and *u*, *ou* and *eu*, *oi* and *ai*. The *e*, rarely accentuated, assumes different sounds. The consonants *s* and *z*, *s* and *r*, are used freely, the one for the other, *oiseau* and *oizau*; and while in most cases one of the two forms has disappeared, both *chaise* and *chaire* have continued to be used simultaneously, though with different meanings. Phonetics are in close connection with orthography, and they have been studied with great care since the middle of the nineteenth century, especially with a practical object in view. Lesaint, Vogel, and, above all, since 1887, Paul Passy should here be mentioned. Passy's little treatise, *Les sons du français*, is widely known. Ch. Nyrop, a Dane, has also made for himself a reputation in this domain. His *Manuel phonétique du français parlé* (1902) is a model of patient, accurate, and impartial labor. In America, Professor Grandgent, of Harvard University, has employed the phonetic method with success in his widely used school books.

VERSIFICATION. The chief element of Latin poetry was the quantity of the syllables. This has been altogether given up in French versification. A few poets, especially in the sixteenth century, Balf and Jodelle, for instance (see FRENCH LITERATURE), under the influence of the Renaissance, tried to write French poetry according to the Latin system. They never succeeded in producing anything satisfactory.

The elements of French versification are three: (1) The number of syllables, from twelve down. The mute syllables at the end of a verse never count; in the middle of the verse they sometimes count, sometimes not; the number changes more or less according to the epoch. In the Middle Ages the poet was very free; in the classical period he was less so. The Symbolists of the

end of the nineteenth century have frequently allowed themselves as great a liberty as the poets of the twelfth and thirteenth centuries. (2) The accentuation. The verse must always end on an accented syllable, and if the verse is divided into smaller parts (e.g. 6 + 6, 4 + 4 + 4, 6 + 4, 4 + 4, etc.), each part in its turn must end on an accented syllable. By accented, one must understand the last syllable of a word of importance for the meaning conveyed, or an important monosyllable, such as a noun or a verb. Articles, conjunctions, and prepositions are rarely in place as accented syllables. (3) The rhyme. The original form is the assonance, i.e. the repetition at the end of a verse of a vowel sound. We find, for instance, the following assonances in a stanza of the *Chanson de Roland*: *abe, able, abre, ace, aile, etc.*, or *i, id, ilz, vi, etc.* Rhyme is only a more perfect assonance, the letters following the vowel being also made to agree, thus *courage, village*. Still later the consonant preceding the vowel of the rhyme was required to be the same in both words (*consonne d'appui*); thus, *orage, courage*. The latter is called 'rime riche' or 'pleine,' while the other one is only 'suffisante.'

Different rules concerning the rhyme were added in the course of time: The rhyme was to connect verses two by two; in the sixteenth century it was decreed that two masculine rhymes (i.e. ending on a sounded syllable, like *amour, départ*) must alternate with two feminine rhymes (i.e. ending on a silent *e*, like *table, fille*). The result of these and other rules contributed to make French poetry more regular, but also more monotonous. The yoke of the narrow code of versification established by Malherbe and Boileau in the seventeenth century was not shaken off until the time of Victor Hugo and Romanticism. Even their attempts to gain more liberty were temporarily crushed by the poets of the Parnassian School from 1866 onward. The fight was, however, taken up again and victoriously carried out by the Symbolists: the *vers libre* was the outcome of their sweeping reform. According to them everything, the number of syllables, accentuation, rhyme, depends altogether upon the subjective criterion of each writer; there are as many forms of versification as there are individual poetic feelings. Few of the Symbolists made much use of the freedom thus regained, and a state of equilibrium has slowly come about since the excitement of the contest has passed away. Symbolists have become more inclined to recognize traditional principles, while their opponents have agreed to allow considerably more freedom to the individual tastes of the artist than was formerly the case.

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FRENCH LITERATURE. Eighth Century. The earliest sources of information on Old French are the dictionaries or 'Glossaries' of Cassel and of Reichenau, the former giving translation of Romanic or Old French terms into Old Germanic, the second of Latin words into Romanic.

Ninth Century. The first Romanic text that has come down to us gives the oaths interchanged

at Strassburg in 842 between the two grandsons of Charlemagne, Louis the German and Charles the Bald, against their brother Lothair.

Tenth Century. The earliest literary documents which are in our possession have all a religious character; they are the "Cantilène de Sainte Eulalie" (a short song celebrating the martyrdom of the saint); the "Fragment de Valenciennes" (homily on the prophet Jonas); a poem on the Passion of Jesus Christ; a Life of Saint Léger.

Eleventh Century. A Life of Saint Alexis. To the end of this century belongs the flowering of the national epos, the *Chansons de Gestes*. These were long poems relating the heroic deeds of Christian knights (*gestes*, Lat. *gesta*, deeds); they seem to have been composed, in most cases, by the reunion of smaller popular songs. There is, however, considerable discussion on this point. At first the chansons were usually sung by the poets themselves, called *trouvères* in the north of France and *troubadours* in the south; later on this became the function of a particular class of men called *jongleurs* (*joculatores-jogleors*) or *ménéstrels*. Both the poets and the singers were for a while a great power in the society of the Middle Ages, as they were able to make and unmake the reputation of a baron by what they chose to sing of him or of his ancestors. Their influence has been compared to that of the newspapers of later centuries. They allowed themselves to be bribed, and the kings and the Church had to make severe laws against them. This, however, was not the case from the beginning. The authors of the chansons drew their inspiration mainly from three different sources, and their poems belong accordingly to one of the three groups known as the French, the Breton, and the Classical Cycles.

The *Cycle de France* deals especially with French heroes who had put their arms at the service of God and the Church. The central figure is Charlemagne, who is made the great champion of Christianity. The task ascribed to him is the same as Christ's—to conquer the world for God. The great Emperor was represented as surrounded by his vassals, as Christ by His disciples. There were twelve chief barons, the peers of France, as there had been twelve Apostles; one of the Apostles had been a traitor, so there was a traitor (Ganelon) among the twelve peers. God repeated in favor of His kingly servant the miracles He performed formerly for His chosen people. He stopped the sun in its course in order to allow the Christian knights to complete the extermination of the pagans, and at times He sent down His angels to deliver heavenly messages and to help His soldiers in case of great danger. The most ancient, beautiful, and famous of the epics of this group is the *Chanson de Roland*, composed probably at the end of the eleventh century, containing about 4000 verses, whose author is not known. The rear guard of Charlemagne, headed by Roland, is attacked and cut to pieces in the pass of Roncesvalles, in the Pyrenees, and none escape. It is on this rather thin theme that legend worked and brought forth the great chanson in three parts: the betrayal of Roland by Ganelon, the death of Roland at Roncesvalles with the eleven other peers and 20,000 men, and the avenging of Roland achieved by Charlemagne. The sincere Christian spirit

underlying the whole poem is wonderfully well shown in the beautiful figure of the bishop-knight Turpin. Other remarkable chansons of the Cycle de France are: *Aliscans*; *Raoul de Cambrai*; *Garin le Lorrain*; *Les quatre fils Aymon*; *Ogier le Danois*.

The *Cycle de Bretagne* betrays an altogether different spirit, as already shown by the second title often given to it, *l'Épopée courtoise*. Its chief poet is Chrétien de Troyes. Chivalrous deeds are here still in great honor; but they are no longer performed for the sake of God and the Church and 'la douce France.' A true Christian spirit is rarely present, despite the frequent allusions to the Bible or to ecclesiastical customs, and the use made of certain pseudo-evangelical scenes, as, for instance, in the rather extraordinary fusion of the originally pagan legends of Brittany with the Christian legend of the Holy Grail in the last and unfinished poem of Chrétien de Troyes, *Perceval le Gallois*. Love, conceived of as the source of all human virtues, and impersonated in fair ladies, may be said to be in this cycle the only power which claims the devotion of knights and barons. The central figure is here Arthur, or Artus, King of Brittany. He also is surrounded by twelve peers, with a traitor (Mordret). The twelve peers are seated at a round table, the symbol of the perfect equality of them all, hence the name of Knights of the Round Table often given to them. The principal poems of the cycle are: *Lancelot du Lac*; *Ivain le chevalier au lion*; *Erec et Enide*; *Merlin*; *Tristan*; *Perceval*. In no one does the spirit of the whole cycle come out in its good and bad features so clearly as in the romance of *Tristan and Iseut*. Under strict orthodox appearances the fundamental ideas at work are worldly love and pagan fatality, as shown in the symbolic passion-breeding-philtre, and in a number of other elements borrowed from the world of magic and of the fairies. Shorter poems, treating Breton legends, are in close connection with the *Épopée courtoise*. They are called the *lais Bretons*, and were sung like the epics. Here the influence of the Church has almost completely disappeared even in words. Love is the only motive, and the *esprit chevaleresque* in the modern sense of the word comes out still more unhampered than before, and even with a foretaste of *préciosité*. The scenes are laid in Brittany or in Wales. Marie de France is the author of these graceful poems. The best known, most refined, and at the same time most characteristic of her manner are: *Eliduc*; *Les deux amants*; *Le rossignol*; *Lyonec*. Among the *lais* of other authors may be mentioned *Tydorel*; *Guingamor*; *Graelent*; *Doon*; *L'Épine*. To the same kind of literature, although the heroes are not from Brittany, belongs *Aucassin et Nicolette*, a 'chante-fable' of the twelfth or thirteenth century. It gives, half in prose and half in verse, the story of the love of a noble's son for a slave girl, who finally turns out to be a king's daughter.

The *Cycle antique* is the least important of the three groups of epics. The authors turned to antiquity to find new material for their poems; they Christianized Agamemnon, Achilles, Ulysses, and all the heroes of Thebes, Troy, and Rome. The best known among their production is the *Roman d'Alexandre*, which contains some most extravagant adventures. It was written probably

in the twelfth century, by Alexandre de Bernay, has 12,000 verses of 12 syllables, instead of 10, as in the *Cycle de France* and the *Cycle Breton*. The *Roman de Thèbes* and the *Roman de Troye*, belonging to the same group, are composed of octosyllabic lines.

All this mass of epic and chivalrous literature dealt with heroes taken from the higher classes of society, and was more particularly written for the nobility. There existed, however, simultaneously a more popular literature. Its products are less pretentious, but just as important as expressing the spirit of their epoch. They are short stories in verse. A good many among the earliest that we possess betray the absolute control of the Church over literature. The purpose of the *contes dévots* or *contes pieux* was to foster faith among the people and at the same time to bring some consolation for the hardships of life to the lowly. The saints and especially the tender, compassionate Virgin prove always ready to fight the devil or intercede with God in behalf of faithful servants of the Church. As the Church lost its empire over souls, and lay authors began to write, the stories that were written assumed a more worldly character. If a few of the innumerable *fabliaux* or *fardeaux* of the Middle Ages may be called didactic, by far the greater number have no other purpose than to entertain. Some are really artistic and graceful, with that touch of satire which is characteristic of the French people; but often the wit and humor are spoiled by coarse realism. Among the best may be mentioned the *Lai d'Aristote*, *Lai de l'oyselet*, *La housse partie*, *Le vair palefroi*, *Le vilain mire* (the original of Molière's *Médecin malgré lui*). The *fabliaux*, in which the talent for story-telling of the French nation is for the first time clearly shown, flourished especially during the twelfth and thirteenth centuries. They became rare in the fourteenth. Some of them were used at that time as themes for the stage, but most of them disappear temporarily, to be used again in prose two centuries later.

The satire on the different classes of society makes its appearance on a large scale during the same period in two long poems, *Le roman de Renart* and *Le roman de la rose*. The first is an animal epos of about 32,000 verses, not counting the 'branches' which were added later, and which would raise this number to over 100,000. The clergy, nobles, and villains are mercilessly criticised, though seldom with bitterness. Several collections of ancient animal fables written in Latin and known under the name of *Ysopets* (corruption of *Esopets*, or little *Æsop*), together with the *Bestiaires*, compositions ascribing moral traits to real or fantastic animals, had prepared the way for this kind of literature. Marie de France had translated a collection of fables into French verse. There are two sworn foes in the *Roman de Renart*: Isengrin, the wolf, and Renart, the fox, symbolizing strength and cunning. The general idea underlying the different episodes is that evil reigns supreme over society, brute force crushes weakness, cunning alone can overcome strength. In the *Roman de la rose*, allegory goes still further: the abstract ideas themselves are personified. A lover wishes to pick a symbolical rose, which grows in a symbolical garden. He is helped in his under-

taking by Bel Accueil, Doux penser, Espérance, etc., meanwhile fighting Danger, Male bouche (slander), Jalousie, and so forth. The author of the first 4000 verses, Guillaume de Lorris, had left the poem unfinished. His sole thought had been to offer in a poetical form a kind of code of love. But, fifty years later, Jean de Meun added 18,000 verses, in which, with abundant scholarly references to Ovid and other ancient authors, he directed venomous attacks against women, and the conventional affected and false forms that love had assumed at this period, more especially in the higher classes of society. The success of the *Roman de la rose* was considerable not only in France, where its influence continued far into the seventeenth century, but all over Europe. Imitations and translations appeared everywhere.

Lyric poetry attained a great measure of popular favor during the Middle Ages, at first more particularly in the south of France. But a great number of ballades, pastourelles, chants-royaux, triolets, lais, virelais, sirventes, motets, were lost. We know, however, about 200 names of authors; moreover, 600 of these short poems have come down to us anonymously. There were a great many academies named Puys which encouraged lyric and sometimes dramatic poetry by organizing contests and awarding prizes. Among the poets that we know, a special mention is due, in the thirteenth century, to Thibaut, Count of Champagne and King of Navarre, and Colin Muset, an itinerant minstrel; and in the fourteenth century, to Christine de Pisan, Eustache Deschamps, Guillaume de Marchault, and chiefly to Rutebeuf, a Parisian trouvère of the Bohemian type, who took great interest in the events of his time, crusades, Church discussions, and university matters; besides his little masterpieces of lyric and satiric poetry, he wrote a few *contes dévots*, *fabliaux*, and a miracle play. In the fifteenth century, Charles of Orléans, after his return from England, where he was a political prisoner for twenty-five years, and where he wrote most of his poems, made his brilliant court an asylum for letters and art. The greatest of these lyric poets up to the sixteenth century was François des Loges, known to fame as Villon. Owing to the resistless charm of his verses, to his absolute sincerity and spontaneity of inspiration, he has more than once been regarded as a kind of patron saint by the lyric poets of the nineteenth century. His chief compositions are two collections of short poems, *Le grand Testament* and *Le petit Testament*.

The theatre is the field in which the evolution of literature during the Middle Ages is most clearly shown. At first an institution of the Church, it gradually severed its connection with it, until finally theatre and Church came to be mortal enemies. The *dramas liturgiques* of the eleventh century were representations in the churches of biblical scenes, more especially of the nativity and passion of Christ. They were written in Latin prose, and composed exclusively of sentences of the Holy Scriptures. Moreover, the actors were all *clerici*, that is, officers of the Church. Then came, in the twelfth century, the *drame profane* or *sécularisé*. The scenes are still biblical, but imagination is permitted to play a greater part; the language is no longer Latin, the actors are laymen, the stage is removed from

the church to some public place. The *Représentation d'Adam* is the only piece preserved in its integrity that belongs to this early period of the French stage. The scenes are episodes from the book of Genesis. They are followed by predictions by the prophets of the coming of Christ, and the performance ends with a sermon describing the terrible signs which will form a prelude to the Last Judgment. In the thirteenth century the scope of the theatre is extended by the addition of miracle plays illustrating the marvelous deeds of the saints and especially of the Virgin. Rutebeuf has put in dramatic form the old fabliau of Saint Théophile, whom Mary frees from the clutches of Satan. *Le jeu de Saint Nicolas*, by Jean Bodel, another miracle of the same epoch, offers several scenes which have nothing to do with religion. Even a few purely comical pieces, such as *Le jeu d'Adam ou de la feuillée*, by Adam de la Halle, are now represented, though they seem to be an exception.

In the fourteenth century, which, on account of continual political and social disorders, was rather poor in literary productions of any kind, no new step toward emancipation from the Church is noticeable. The *Miracles de Notre Dame* remained the favorite theme, while scenes for religious plays are borrowed from all quarters, even from the *chansons de gestes* and *romans d'aventure*.

No form of literature is more popular during the fifteenth century than the theatre. *Mystère* is the name given henceforth to religious and even, though rarely, to non-religious plays, as for instance the *Mystère du siège d'Orléans*, which represents the rescue of that city by Joan of Arc, and the *Mystère de la destruction de Troie*. A feverish interest in theatrical representations took hold of the people at that period. The *mystères* were put on the stage with most elaborate machinery. Some of them had over 50,000 verses and lasted several days. Kings, nobles, and bourgeois vied with one another in their zeal for these plays. There was, however, something artificial about this universal enthusiasm; the plays are prolix; moreover, a tasteless abuse of the comic and coarse elements clearly indicates that the genre had outlived itself. In 1548 the Government had to withdraw the license to play from the 'Confrères de la Passion,' a society of actors in Paris, on account of the lack of decency in these so-called religious performances, and thus put an end to the mysteries. On the other hand, the profane theatre, free from the influence of the Church, was then coming to the front full of life and vigor.

The three principal kinds of plays in the second half of this century are the *moralités*, the *farces*, and the *sotties*. The *moralités* are a genre between the religious and the comic; sometimes grave, sometimes gay, they have a didactic purpose; frequently the characters are allegorical, like those of the *Roman de la rose*, which had set the fashion. The *farces* correspond on the stage to the *fabliaux* in the evolution of the verse story-telling; they are mildly satirical, the main purpose being to amuse. Coarseness is a common feature. Here belongs the first masterpiece of the French comic theatre, *L'Avocat Pathelin*, the author of which is not known. The sincerity of its humor and the keenness of its psychological observation are remarkable. The

moralités and the *farces* were performed by special associations, such as the 'Confrères de la Basoche,' in Paris. The *sotties* were played by the 'Confrères des Sots' (fools), who only assumed the guise of folly as a stalking-horse for their wit, and for attacks on the clergy, nobility, and all other great personages of the day. Originally they were merely farcical interludes of the mysteries, but owing to their revolutionary character they had to be removed from the latter, and thus acquired independent existence.

Except in one domain, that of history, one may well say that prose does not count in French literature before the sixteenth century. Translations are few. The long *romans d'aventures* that have enjoyed a certain popularity since the thirteenth century are nothing but dreary, prolix repetitions in prose of the *chansons de gestes* and *épopées courtoises*. Leaving aside Wace's *Roman de Rou*, also called *La geste des Normands*, which is a treatment in verse of the history of the Dukes of Normandy during the tenth century, there are only a few historians deserving of mention: in the twelfth century, Villehardouin, who relates, in his *Histoire de la prise de Constantinople*, the story of the fourth Crusade, in which he personally took part; in the thirteenth century, Joinville (*Mémoires sur la vie de Saint Louis*), one of the vassals of Louis IX., whom he accompanied in his first expedition to the Orient; in the fourteenth century, Christine de Pisan (*Vie de Charles V.*), Alain Chartier (*Histoire de Charles VII.*), and especially Froissart, who in his *Chroniques* gives a somewhat disconnected but most vivid picture of the brilliant period of the Chevalerie (his authorship of many of the best chapters is now questioned); in the fifteenth century we have in the *Mémoires* of Commines the first connected account of political events from the point of view of a statesman; he has many ideas in common with Machiavelli, and is the precursor of many eminent philosophical historians in France, of the type of Bossuet, Montesquieu, Guizot, Thiers, Michelet, and Taine.

The sixteenth century was a period of transition, marked by the penetration into France of the ideas of the Renaissance. As regards the stock of ideas available for artistic purposes, it must be acknowledged that French literature had become rather thin since the time of the great epics. The studies of the classical authors came just in time to introduce a new stream of thoughts, and to inspire literature with a new life. In 1531 Francis I. had established the Collège Royal de France (now Collège de France), in which only Hebrew, Latin, and Greek were at first taught, other studies coming later. The influence of this institution was almost instantaneous, and a rich harvest of scholars was the result. Among them were such men as Budé, Daurat, Pierre de la Ramée, and especially two who acquired a world-wide reputation: Jacques Amyot, thanks to his admirable translation of the *Lives* of Plutarch, and Henri Estienne, the author of the *Thesaurus Lingvæ Græcæ* (a work of immense erudition for the time), of the *Traité de la conformité du langage français avec le grec*, and of the *Précélence du langage français*, in which he protests against the invasion of Italian idioms that was taking place at this

epoch, owing to the presence at Court of Catherine de' Medici. See FRENCH LANGUAGE.

The influence of the Renaissance was especially marked in the domain of poetry. The last poet in the manner of Rutebeuf and Villon was Clément Marot. In his epistles, ballades, elegies, epigrams, etc., we find the same wit and satirical humor as in the work of his predecessors. He was, however, by no means a stranger to the new opinions; his attitude in religious matters roused persecution, against which he had to take refuge in Italy, where he died. Moreover, his translations of authors like Vergil and Ovid prove his interest in ancient literature. But it remained for the poets of the next generation to give vent in their original compositions to the new spirit created by the Renaissance. Seven of them—the poets of the *Pleïade*, Daurat, du Bellay, Ronsard, Belleau, Jodelle, Baif, Pontus de Thiard—combined their efforts to bring about a new literary era. Their aspirations are set forth theoretically in du Bellay's *Défense et illustration de la langue française*, and practically in a great number of poetical writings. Ronsard is, by common consent, considered the head of the group. With the sole exception of tragedy, he endeavored to resuscitate all the genres of antiquity, even the epos (*La Franciade*), and furthermore adopted the Italian sonnet which had come in along with the Renaissance. The three directing principles of the school are: (1) their contempt for the light French poetry of the foregoing centuries, such as Villon's and Marot's; (2) their belief that one who wishes to do truly artistic work must study the ancients and imitate them; (3) their love for French vernacular. With regard to the last point, the work of the *Pleïade* has been long misunderstood. They have been accused of overloading French with strange words. On the contrary, they protested, as a matter of fact, against the tendency manifested by many unintelligent humanists to introduce into French a number of Greek and Latin terms which gave the language a false air of erudition, and made it heavy and inharmonious. A famous verse of Boileau on Ronsard,

"Mais sa muse en français parlait grec et latin,"

is responsible for the error of three centuries. The juster appreciation of the achievements of these poets, brought about by such authorities as Petit de Julleville, has destroyed the traditional belief in a supposed opposition between the views of the *Pleïade* and Malherbe. The latter, though himself convinced of his complete disagreement with Ronsard, was really aiming at the same goal, i.e. the purification and refinement of the French language and poetry. But while Ronsard was a true artist, who could rely upon his literary tact and feeling, Malherbe had the spirit of system, requiring rules in all places and at all times, to the detriment of spontaneity and inspiration. Malherbe's mantle was taken up later by Boileau, a man fashioned like him in the schoolmaster's world, and it is he who is responsible to no small degree for the stiffness of French poetry in the great century of its literature. The yoke of Malherbe was unbearable to most poets of real talent. Both Desportes and Berthaut followed Ronsard, while Mathurin de Régnier (the earliest representative of modern French satire) and Théophile de Viau deliberate-

ly attacked Malherbe, claiming the rights of freedom and originality.

On the stage, in the sixteenth century, there were a few rather awkward attempts at classical drama. Jodelle, one of the members of La Pléiade, entered the only field left untouched by Ronsard in his imitations of ancient literature, and wrote his tragedy, *Cléopâtre*, in which, for the first time in France, the three Aristotelian unities of place, time, and action were observed. Garnier followed in the steps of Jodelle. Larivey imitated servilely the Italian comedy, but had the honor to provide Molière with several suggestions.

In the domain of fiction, the short story in prose, already in favor in the fifteenth century when the collective work of the *Cent nouvelles nouvelles* appeared, is at its best with Marguerite de Navarre, the sister of Francis I. She wrote (perhaps not without help) the *Heptameron*, an imitation of Boccaccio's *Decamerone*. Part of her material is taken from the fabliaux. Bonaventure Desperiers, her secretary, cultivated with success the same genre. The art of story-telling is also remarkably exemplified in the *Mémoires* of Montluc and of La Noue, and in Brantôme's *Grands capitaines* and *Dames galantes*. Brantôme did for the society of his time what Froissart had done for that of the thirteenth century. The writer who succeeded best in absorbing all that is good in antiquity, without losing the grace and freshness of French wit and humor, is Michel de Montaigne. In his delightful *Essais* the philosophy and belief of the Middle Ages are compared with those of ancient civilization, and the result is the refined and gentle skepticism which has made the "Que sais-je?" of its author a watchword for many cultivated minds ever since. What Montaigne had said, with seductive art and complete freedom from pedantry, was repeated with all the apparatus of logical demonstration by his friend Charron, in *De la sagesse*.

When Rabelais, the greatest literary figure in the sixteenth century, appeared, the conditions all over Europe were exceedingly precarious and the prospect for the future very gloomy. France had not yet recovered from the Hundred Years' War; Rome had been sacked by the French troops, and the Pope was no longer secure in it; Germany was the prey of terrible religious disorders, the Peasant Revolt, and the movement of the Anabaptists; finally, the Turks were threatening Christianity in the East. Yet Rabelais had the courage to break out in Homeric laughter. In his *Histoire de Gargantua et de Pantagruel* he ridiculed the murderous political wars of the time, the quarrels of the Church and of the different ecclesiastical orders, the pretentious and shallow erudition of the scholars, the revolting method by which magistrates and judges rendered justice—in short, all the abuses and follies of the turbulent times, which then marked the course of European civilization. But he is not content with negations; his keen good sense suggests to him a number of useful reforms in all the domains of life, education, science, religion, politics. Some of these reforms have been realized, some of them we are still striving to bring about. The greatest social power in the Middle Ages, the Church, had been severely shaken. At this moment the Reformation appeared upon the scene of which Calvin was chief exponent in

France. He was so full of the idea of the absolute authority and power of God, that in his *Institution chrétienne*, a masterpiece of logic and deep faith, he does not shrink from the extreme consequences of the theory of predestination. His efforts against Rome were ably supported by Théodore de Bèze, and especially Agrippa d'Aubigné, a man of wonderful personality, who fought with enthusiasm and untiring energy, with sword and pen, against the power of the Pope. His poem in seven cantos, *Les tragiques*, is one of the most powerful outcries of indignation the world has ever heard. To meet the danger of the domination of the League, a few devoted citizens (among them Pierre Pithou, Gillot, Passerat, Rapin) wrote a number of short pieces in prose and verse, in turn satirical, eloquent, comic, and grave, appealing to the patriotic feeling of their countrymen. These compositions were published in book form in 1594 under the title *La satire mérippée*. Another political writer of the same epoch was La Boétie, the friend of Montaigne, who in his book *Traité de la servitude volontaire* expressed even then opinions which were formulated two centuries later by Rousseau and by the leaders of the French Revolution.

The seventeenth century is known as the classic century of French literature. It differs from the sixteenth in its greater unity. It carried the French language to a point of literary perfection, a form that will be difficult to surpass. Two institutions more particularly contributed to this result: the Hôtel de Rambouillet and the Académie Française. The Marquise de Rambouillet brought together in her salon the most refined and cultivated people of Paris, and thus exerted a beneficial influence, moral, social, and literary. There Balzac, 'le seul éloquent,' first gave utterance to the great French 'période oratoire,' while Voiture was the foremost representative of the witty, light, amiable side of the French character. Other salons were formed on the model of the Hôtel de Rambouillet; that of Mlle. de Scudéry (*les samedis de Sapho*) deserves special mention. The habitués of these salons are the 'précieux' and 'précieuses' of whom Molière was so ridicule so amusingly; yet one must not lose sight of the excellent refining results of these coteries. They are apparent, for example, in the *Lettres* of Madame de Sévigné, and in many other representatives of *Le style épistolaire* in that century and the next.

The Académie Française was first a private society of scholars, then transformed more or less willingly, in 1635, at the instigation of Richelieu, into an official State corporation. The Academicians were to publish a dictionary, a grammar, and a rhetoric. The dictionary alone was completed. Vaugelas, the author of the *Remarques sur la langue française*, contributed more than any other to this work. Among the other original members of the Académie are Conrart, its first president; the poets Chapelain, Maynard, and Racan; Balzac and Voiture; and Furetière, who was expelled for having published a dictionary before that of the Académie.

The great authority in literature, however, was neither the Hôtel de Rambouillet nor the Académie, but Boileau, who, with an undeniable critical talent, made and unmade reputations at will, seldom going astray in his judgments. Like

Malherbe, he formulated in his *Épîtres* and in his *Art poétique* a code of literature; whatever did not meet its requirements was pitilessly condemned. Poets like Théophile de Viau and Scarron, the creator of the *genre burlesque* (*Virgile travesti*), are among his victims. He had nothing but contempt for Ronsard and his school, and yet he himself accepted the ancients as the criterion of excellence and even became the chief advocate of classicism in the great 'Querelle des anciens et des modernes,' which raged through many years of the seventeenth century; while Perrault, who had started the debate, was the principal representative of the 'modernes.' Proceedings of so imperious a character were only the application to the field of literary criticism of the principle of authority which regulated the whole life of the seventeenth century, social, ethical, religious, artistic. If France received strong political unity at the hands of Richelieu and Louis XIV., it was at the expense of that individuality which had characterized so many authors of the anarchistic sixteenth century. Protestantism had been crushed out, not so much on account of its intrinsic defects as by reason of political necessities. Everywhere the same system of government prevailed: anything threatening to become *imperium in imperio* was doomed to suppression or transformation, while only what accepted and reflected directly or indirectly the social ideal of the time was allowed to develop. Bossuet was really the incarnation of his century in literature; the authority of God, the authority of the Church, the authority of the King, are the themes of his works, and the grandeur which cannot be denied to this epoch can be seen in each sentence written by the 'Aigle de Meaux,' whether in his splendid *Oraisons funèbres*, *Sermons*, and *Discours sur l'histoire universelle*, in which the great of this world are like dust before God, or in his *Histoire des variations des églises protestantes*, and his attacks on Fénelon and Quietism, in which he affirms the absolute control of truth by the Roman Catholic Church, or yet again in his *Déclaration du clergé de France*, in which he defends the claims of the Gallican Church to certain liberties from papal jurisdiction. The same is true of his contemporary Bourdaloue, even more famous than Bossuet in those days for his pulpit eloquence, and, though to a less degree, of Fléchier. Even Fénelon, 'le cygne de Cambrai,' by humbly accepting the condemnation by Rome of his *Essais sur les maximes des saints*, showed how deep-rooted the idea of social and ecclesiastical hierarchy was in the temperament of that remarkable epoch. He had also to learn by bitter experience what it cost to suggest (in the *Voyage de Télémaque*, written for his royal pupil, the Dauphin) modes of government which did not agree with the autocratic ways of Louis XIV.

In the drama the notion of authority takes a somewhat different form, but is as much emphasized as in Bossuet. Corneille's tragedies, *Le Cid*, *Horace*, *Cinna*, *Polyeucte*, and his comedy *Le menteur*, preach an unconditional surrender to the laws of honor and conscience, of God and the State. Racine, though his artistic tact raised him in many respects above the narrow spirit of his age, is not free from it, nevertheless, as is well shown in his fundamental thesis of the submission of man to his passions (*Andromaque*,

Phèdre, *Iphigénie*, *Bérénice*, *Britannicus*), and in his illustrations of the omnipotence of God in his later religious plays, *Esther* and *Athalie*.

There are, however, a few men in the seventeenth century who do not assume this attitude of deference to conventional grandeur and worldly power. Chief among these is Molière (pseudonym for Jean Baptiste Poquelin), who attacks in his comedies, on the one hand, the *idola fori* of his contemporaries, as for instance the current affections of the society of his day (*Précieuses ridicules*, *Femmes savantes*, *Bourgeois gentilhomme*), and the false erudition of scholars, especially ignorant physicians (*L'amour médecin*, *Médecin malgré lui*, *Malade imaginaire*); and, on the other hand, the general views of humanity, as in *L'avare*, *Tartufe* (religious hypocrisy), *Don Juan* (affectation of unbelief), and *Le misanthrope*, his masterpiece.

Descartes refused to accept the traditional Catholic foundations of metaphysics. He invented a system of his own, resting on the proposition "Je pense, donc je suis" (I think, therefore I am); but he had to take refuge in Holland, in order to complete and give free expression to his new philosophy—a creed not so different from the orthodox as might be imagined if we were to form our judgment solely from the negative part of the doctrine (*Discours sur la méthode*, *Méditations philosophiques*, *Principes de philosophie*, *Traité des passions de l'âme*). Thanks to a most cautious and subtle way of expressing himself, Malebranche, Descartes's pupil, was able to publish his long treatise *De la recherche de la vérité*, and remain in Paris without being prosecuted. In the line of theology the whole group of the Jansenists, who resembled in some respects the Protestants, especially in their hostility to the teachings of the Jesuit Order, was subjected to persecution. They produced some of the most powerful and original writers of the time: Antoine Arnauld, Pierre Nicole, and, above all, Pascal, who has often been called the most profound of French thinkers. His literary bequest is the *Pensées* (notes prepared for a work on the truth of the Christian religion and published after his death), and the *Lettres provinciales*, a most forcible and effective satire on the Jesuits. Among the moralists of this epoch are La Bruyère (*Les caractères*, *Pensées*) and La Rochefoucauld (*Maximes*); better described perhaps as clever piecemeal psychologists than as powerful ethical philosophers. Madame de Maintenon, in her letters, deals chiefly with problems of education. Though a progressive spirit is shown in some of her theories, she is on the whole, like Fénelon, a being of her time.

La Fontaine, whom his contemporaries nicknamed 'Le bonhomme,' is a writer of marked originality. In his charming *Fables* and in his *Contes* (which remind one in their substance and form of the old *fabliaux*) we have once more a representative of the genuine 'esprit français' as it existed before the Renaissance. He had fed on all the poetic treasures of antiquity that came in his way, and created them, as it were, anew, by his graceful, light, and artistic verses.

Another man who freed himself from the conventionalities of the seventeenth century, and restored the connection with the national artistic tradition of France, is Charles Perrault, the author of the naïve and humorous nursery tales.

His *Contes* found hosts of imitators, even late into the eighteenth century.

The numerous novels of this period also indicate a revival of the literature of the Middle Ages, particularly in the style of the *Roman de la rose*. But the reconciliation of natural feelings and conventionality is here far from being so complete as in the writings of the two authors just mentioned. The lack of harmony between the two tendencies is disagreeably in evidence in all these tedious novels, many of which extended to ten volumes. The only outcome of their efforts is an intolerable sentimentalism expressed in the exasperating jargon of 'précieuses,' who play their parts in the garbs of shepherds and shepherdesses. Let us mention only La Calprenède, and Honoré d'Urfé (*L'Astrée*), and Mlle. de Scudéry (*Le grand Cyrus*, *Clélie*), who invented the *Carte du tendre* (map of tender feelings), and did in prose what Racan in his *Bergeries* had done in verse and in drama. The first example of the French novel, in the modern sense of the term, is Mme. de la Fayette's *Princesse de Clèves*, but it stands by itself. Coarseness disfigures Cyrano de Bergerac's satirical *Histoire comique des états du soleil et de la lune*, and his comedy *Le pédant joué*. Scarron's *Roman comique* is a faithful picture in the form of fiction of an actor's life in the century of Molière.

The memoir literature continues to enjoy favor in France. La Rochefoucauld and the Cardinal de Retz are the two best representatives in this field at this time.

We reach the threshold of the eighteenth century with the *Mémoires* of Saint Simon, who portrays in a lively style the still brilliant, but now thoroughly corrupt, Court of the last years of the 'Roi Soleil.' Although rotten at the core, so strongly organized a society as that created by Richelieu and Louis XIV. could not fail to hold together for a time. Everything, literature included, continued for a while on the old lines, and until far into the eighteenth century we have nothing but a servile imitation of the seventeenth century. Regnard and Dancourt are imitators of Molière; Crébillon takes up the bequest of Corneille and Racine; Chamfort and Rivarol once more echo the spirit of the 'précieuses'; Florian sometimes reminds one of La Fontaine; Massillon follows in the steps of Bossuet, and d'Aguesseau is a master of pompous style in political eloquence. J. B. Rousseau and his disciple Lefranc de Pompignan are lyric poets whose writings are in the style of the earlier century; the same is true of Louis Racine, the son of the great dramatist, and also true perhaps of Gilbert; it is only at the end of a life which spanned the century that even Fontenelle learns to appreciate the aspirations of the new generation in his work of popular science, *De la pluralité des mondes*. Besides those just mentioned, a number of authors spend remarkable gifts in fruitless activity. Their works, although sprightly and witty, hardly contributed anything toward progress in literature and art. Among them are Marivaux, who wrote exquisite comedies; Piron, Gresset, even Nivelle de la Chaussée, with his *Comédie larmoyante*, and Ducis, who tried to introduce Shakespeare into France. At the same time there are on the stage a few plays which announce clearly enough

the times that are approaching. Le Sage, in his bitter *Turcaret*, and Destouches, in *Le glorieux*, expose the moral unworthiness of those who claim to rule over their fellowmen by divine right; while Diderot, in *Le fils naturel*, Sedaine, in *Le philosophe sans le savoir*, and Beaumarchais in *Figaro*, already affirm deliberately the merits of the bourgeoisie. In his drama *Charles IX., ou L'école des rois*, M. J. Chénier directly attacks monarchy as a system of government. And soon after, the brother of the latter, André Chénier, strikes his lyre in favor of the newly conquered liberty; he was, however, to pay with his head for the indignant and patriotic protests that he uttered in his *Jambes* against the horrors of the Terror. Three other descriptive poets, contemporaries of Chénier, call for a passing mention here: Delille (for his poem *Des jardins*), Lambert (*Les saisons*), and Roucher (*Les mois*). The gospel of tolerance gains ground daily, thanks to works like Le Sage's *Gil Blas*, and Marmontel's *Contes moraux*, *Bélisaire*, and *Les Incas*, in the domain of the novel, while men like the Abbé Fleury and Rollin in education, and Vauvenargues in ethics, slowly and quietly suggest positive reforms.

If the list of highly talented men in the eighteenth century is very long, that of writers of real genius is short, as compared with the preceding period. At the opening of the century there is Bayle, the scholarly and bold author of the *Pensées sur la comète*, and of the *Dictionnaire historique et critique*. As early as 1697 all the traditional doctrines that will be swept away by the Revolution are made a target for his dialectic, and many new ones are announced. He was a precursor of Voltaire. Besides the advantage of a timely appearance, Voltaire had the considerable advantage of a clear and beautiful style. He is the incarnation of the eighteenth century. In one part of his work, nevertheless, Voltaire plainly belongs to the group of continuators of the traditional and classical literature. His dramas, except a few like *Mahomet* (preaching tolerance), which betrays the age in which its author lived, are patterned exactly after those of the seventeenth century; his *Henriade*, an epic poem, is another specimen of a literature that belongs still more surely to the past; and the *Siècle de Louis XIV.* is the glorification of that France whose standards of life he contributed to tear down in so many other writings. In the *Essais sur les mœurs et l'esprit des nations*, he takes up history at the point where Bossuet had left it in his *Discours*, namely with Charlemagne; but while Bossuet had shown that religion is the great leading power of a progressive world, Voltaire proceeds to prove that religion is the mother of all crimes and has positively prevented progress. Voltaire's criterion was plain common sense, and from this stronghold he attacked indifferently the methods by which he considered that the Church took advantage of the imbecility of human nature (*Lettres philosophiques*), the theistic and optimistic systems of philosophers and theologians, particularly the doctrine of the best possible world of Leibnitz and Shaftesbury (his poem *Le désastre de Lisbonne*, his *Contes philosophiques*, *Candide*, *Zadig*), and the men who deny the existence of God (*Si Dieu n'existait pas, il faudrait l'inventer*). His God, however,

is only that of Deism, i.e. a Creator who does not interfere with his creation; in other terms, he does not believe in Providence. Voltaire's action and influence are essentially negative. The only part of his work in which he does not attack others is that in which he tries to spread the scientific ideas acquired in his sojourn in England, especially those derived from Newton's books.

It is from England also, from the empirical philosophy of Bacon and of Locke (whose principal disciple in France was the Abbé Condillac), that the group of writers known as 'le parti des philosophes' borrowed the new conception of the world that they substituted for the traditional philosophy, which they had rejected. They embodied the results of their common efforts in the *Encyclopédie*. Diderot, who, though somewhat capricious, was one of the profoundest writers of the time, made this undertaking the work of his life, enrolling his most distinguished contemporaries as his collaborators. D'Alembert, the mathematician, wrote the *Discours préliminaire*, which established his fame as a writer. It is impossible to mention all those who were connected with the *Encyclopédie* and the 'parti des philosophes.' It is enough to name Mably, Raynal, Grimm, Helvétius, and Holbach. The salons of the time, conducted by a number of very keen and intelligent women, did much to spread the new beliefs. In the field of sociology and politics the most important writer is the Baron de Montesquieu. He began with a most happy and brilliant criticism of the customs of his countrymen in the *Lettres persanes*. Later, in the *Considérations sur les causes de la grandeur des Romains et de leur décadence*, and in his more elaborate work, *L'esprit des lois*, he does away with the merely speculative and *a priori* method of Bossuet in treating the philosophy of history, and replaces it by the empirical and comparative method which has since been applied with greater thoroughness, but not with greater skill or attractiveness, by modern ethnologists and sociologists. Duclos, in his *Considérations des mœurs du siècle*, has approached the same problems, though with much less genius.

The most far-reaching in its consequences of the philosophical principles of the eighteenth century was the return to nature. The affected cult of an unreal nature as it was found in the novels of the 'précieuses' had to go; and if we find an echo of it in Marie Antoinette's *hameau* at Versailles, no author of mark in the eighteenth century makes use of this old ideal. In 1735 the Abbé Prévost offered a first example of natural and passionate love in his novel *Manon Lescaut*, and a few years later the great naturalist Buffon proved that even in the society of the nobles a more truthful conception of nature was not excluded *a priori*. He had a mind of a most aristocratic form, and in his style continued the great traditions of the writers of the 'siècle de Louis XIV.,' yet he devoted his life to writing a monumental work, entitled *Histoire naturelle*, in which the nature that he studies with enthusiasm is one created by God, and not the one invented by ladies and gentlemen of the Court. Most of his opinions are no longer accepted, but they were original at the time, and well calculated to foster interest in a subject so long neglected by philosophers and scholars. Of a some-

what different character, but just as strong and sincere, was the love for nature as it appears in Bernardin de Saint Pierre's *Etudes sur la nature* and *Harmonies de la nature*, and in his romantic idyll *Paul et Virginie*. Full of chimerical ideas, both a poet and a Utopian, he might have been the most representative figure of his time in his chosen field had not Jean Jacques Rousseau forestalled him. An eccentric and restless genius, there can be no doubt that Rousseau provided not merely most of the ideas which the Revolution tried to put in practice, but also many of those that have been elaborated one by one in the literature of the nineteenth century by the romantic and even by the realistic schools. Extreme in everything, he wrote with an enthusiasm which could not fail to stir a society that had grown accustomed to hear only the dispassionate and cold speech of common sense and dry reason. Endowed with a strange combative disposition, he never rested till he had reached the very roots of the evils of his day; he was not content to attack any particular institution, Church, monarchy, or class privileges; his attacks were directed against society as a whole, and he declared the very system of civilization to be rotten, false, and contemptible. That man is a creature of nature, and that therefore nature must be his teacher, his mistress in everything, was with him a fundamental axiom. If he tore down in his *Discours sur les sciences et les arts*, *Discours sur l'inégalité*, *Lettres sur les spectacles*, he tried to reconstruct in the domain of education (*Emile*), in that of the family (*Nouvelle Héloïse*), and in that of sociology (*Contrat social*). The last mentioned is a treatise in which the author endeavors to trace the origin of every organized society to an original though tacit contract between all citizens; the latter freely decide as to the government they want. This implies not only taking away from the dominant class its privilege of ruling, but also the power of appointing and dismissing magistrates at will. The *Contrat social* became the Bible of the French Revolution; this was the authority to which it appealed when it justified the beheading of Louis XVI.

When the destructive storm of the great Revolution was over, Frenchmen realized that it was easier in theory than in practice to change an organization rooted in the tradition of hundreds of years. They were convinced, too, that the old society had not been absolutely bad in all respects. Accordingly, the first years of the nineteenth century appear as a period of reaction against the Revolution in the field of literature as well as in the field of politics. Joseph de Maistre preached in beautiful language on the unconditional return to the old régime, nay even to a mediæval theocracy. The belief in Providence was according to him the only satisfactory philosophy; the Church must rule over Europe, and kings be considered as the sacred representatives of God. Chateaubriand, though Catholic and Royalist, takes into consideration more than De Maistre the events of the eighteenth century. In his *Essai sur les révolutions* he maintains the uselessness of revolution, and later, having undergone terrible personal sorrows owing to the cruelties of the Terror, he finds consolation in the Christian faith ("J'ai pleuré et j'ai cru"). The *Génie du Christianisme*,

written soon after, offers a kind of æsthetic religion for artists rather than a religion for humanity at large. Yet it enjoyed an immense success with his contemporaries, who were tired of negations and greeted with enthusiasm the old belief—even though in a somewhat unusual attire. Chateaubriand, however, is not entirely reactionary; he proves a true son of the end of the eighteenth century when, after his journey to America, he professes a warm admiration for the life of the uncivilized tribes he had visited, and for the grandeur of the scenery (*Les Natchez*, *Atala*). He is also a forerunner of the Romantics in his half autobiographical story *René*, which with *Obermann* by Senancour and *Adolphe* by Benjamin Constant (the great orator of the Restoration), correspond in France to the note struck in Germany by Goethe's *Werther*. Madame de Staël's great achievement was the re-establishment of the connection with the eighteenth century, and especially with Rousseau; in fulfilling this task she shows hardly less passion or conviction than her master. In *L'Allemagne* she advocates the natural and rationalistic religion of Rousseau's *Vicaire Savoyard*; the same work brings out the idea of cosmopolitanism in the intellectual sphere of life which is to be found already in germ in Rousseau. The French Revolution had done away partly with political barriers; it seemed to Madame de Staël that a similar change must take place in the domain of art, and this prompted her to reveal the genius of Germany to her countrymen. Her two novels, *Corinne* and *Delphine*, defend—like the *Nouvelle Héloïse*—the natural rights of love against the conventions of social life. The Romantic movement, which has also been traced back to Rousseau, is the most important literary event of the nineteenth century. No writer of the time is altogether free from its influence. Its purest product is Lamartine. Individualism had won the great battle begun a hundred years ago: the *Méditations poétiques* and *Harmonies poétiques et religieuses* are like a glorious cry of victory crowning the efforts of the eighteenth century. No bitter experience had revealed as yet the deception that awaits the self-worshiper. One would wish that Lamartine had died before he descended from the heights into the arena of political intrigues and soiled his lofty aspirations by contact with reality. His political career was a failure, though—or perhaps because—he was sincere.

Very soon, taking advantage of its first successes, Romanticism assumed an aggressive attitude toward Classicism. Victor Hugo became the leader of the new school, and was joined by Gautier, Sainte-Beuve, Vigny, Musset, Nodier. The great battle by Hugo himself in favor of Romanticism took place on the stage (*Cromwell*, with its important preface, *Hernani*, *Ruy-Blas*, *Marion Delorme*, *Le roi s'amuse*). Alexandre Dumas, the father, and Vigny (in *Chatterton*) supported him. The old school, however, regained a temporary popularity with Ponsard's *Lucrèce*, a play weak in itself, but put upon the stage at the psychological moment when the enthusiasm of the public for Romanticism was beginning to cool. The triumph of Romanticism was in any case of short duration. Some of the most prominent writers of the group quietly withdrew (Sainte-Beuve, Gautier), while others

loudly voiced the bitter disillusion. The pessimistic but proud poetry of Vigny (*Poésies*) and the tragic youthful outcry of despair of Musset (*Les Nuits*, *Souvenir*) are the swan songs of Romanticism. In the domain of fiction, the passionate prose of the anarchistic George Sand (*Indiana*, *Jacques*, *Mauprat*) gradually lost its fervor, and in later years she abandoned the fanaticism of her youth, and sought the harbor of happiness in an old-fashioned, conventional society.

Ever since the Restoration, France has been in danger of a new era of revolutions, and the possibility of having to face another Terror led many to attempt a pacific settlement of the rising social and political difficulties. Among them were the poets Béranger and Casimir Delavigne; the political writers and orators P. L. Courier, Benjamin Constant, Royer-Collard, Lamartine; the historians Guizot, De Tocqueville, Thiers, Blanc, Michelet; the philosophers Cousin, Jouffroy; the socialist Proudhon; the Catholic writers Lacordaire, Lamennais, Montalembert. All the generous efforts of these men were finally brought to an end by the Revolution of 1848, followed three years later by the coup d'état of Napoleon III.

In the meantime, Victor Hugo's fame continued to increase. He was a giant well able to stand the final failure of Romanticism without being carried away in the disaster. Moreover, his conception of individualism had always been very different from that of Lamartine, Vigny, and Musset, and his understanding of the needed reaction against Classicism was more radical, more to the point, and also more according to the trend of ideas since the Revolution. This is the reason why he may be rightly considered the representative of the nineteenth century—the century of democracy—just as Voltaire was the high priest of the eighteenth. Hugo had endeavored to show that man is a tissue of contradiction, a mixture of good and evil, of beauty and ugliness, of grandeur and villainy, with the inference that a king or a nobleman has traits that make him, after all, a very inferior being, while—and this is the chief point—in the humble, the lowest in the social scale, are intimations of sublimity that render him the equal of the most highly honored among men. See particularly the dramas *Le roi s'amuse*, *Marion Delorme*, the novels *Bug Jargal*, *Notre Dame de Paris*, *Les misérables*, and, in the *Légende des siècles*, poems like "Les pauvres gens," or "Le crapaud." Not only are those traits not distinctly romantic, they are even characteristic of the school that was to replace Romanticism, namely, the Realistic. Another important feature that made Hugo a favorite with the masses is his optimism. Though a great satirist in *L'année terrible* and *Napoléon le petit*, his confidence in humanity and God was always predominant. This is, among others, the idea which inspires the whole *Légende des siècles*, poems in the epic style, in which the author wished to show how humanity rises constantly from a lower to a higher level of civilization and happiness.

Two other men in the first half of the century took pains to study man under both his ideal and his baser aspect, but, contrary to Victor Hugo's, their portrayals of characters have a pessimistic tone. The first of these is Honoré

de Balzac, who, in his stupendous *Comédie humaine*, is so anxious to remain faithful to life that, for fear of incurring the accusation of undue indulgence, he shows a strong inclination to lay stress on the weakness of man. The titles of his best-known novels are: *César Birotteau*, *Eugénie Grandet*, *Le lys dans la vallée*, *Peau de chagrin*, *Le père Goriot*, *Séraphita*. The second was Stendhal (pseudonym of Henri Beyle), who, in his detailed studies of the psychological springs of human action (*Chartreuse de Parme*, *Rouge et noir*), seems to have still more deliberately assumed the cynical tone of skepticism as to the very possibility of goodness. The public was not ready for Balzac and Beyle, and a whole generation was to pass away before their efforts were duly appreciated. The old standards had first to be disposed of, and this was the task performed by men like Mérimée, Flaubert, Gautier, Barbey d'Aureville, and the poet Baudelaire. In turn bitingly sarcastic and humorous, they indicated the shallowness and pettiness which the advent of the bourgeoisie had introduced into art. Flaubert, d'Aureville, Mérimée, and Gautier still select the characters of their stories for the most part in the sphere of the romantic, but the method of treatment is evidently realistic. Flaubert's *Madame Bovary* (1857) is in subject and treatment the first great novel of the Naturalistic movement of the third quarter of the century. The victories of science and the success of pessimistic philosophy did much to promote the ultimate triumph of the cause of Naturalism. In the seventies, Zola published the first novels of his series *Les Rougon-Macquart*. The sub-title of the work, "Histoire naturelle et sociale d'une famille sous le second empire," is suggestive enough. To the author, and to the brothers Goncourt, who immediately preceded Zola in this newly opened path, man is a mere product of his *milieu* and of the physical laws of nature, especially those of heredity; therefore he can be understood only by means of scientific study, and true literature must be nothing but a collection of scientific cases carefully recorded. Zola was himself the disciple of the philosopher Taine, who had put forth the principle of his system in the introduction to his history of English literature. But Zola had taken only one-half of the theory, laying stress merely on the physiological causes that influence action; another disciple of Taine, Paul Bourget, studied in his novels particularly man's mental mechanism, as Beyle had done earlier, and represents the 'roman psychologique,' as Zola the 'roman naturaliste.' Bourget was attracted by the study of the female character on account of its complexity; for the same reason he deals by preference with society women rather than with women of the people. His most characteristic novel is *Le disciple*; see also *Mensonge*, *Cœur de femme*, *Cruelle énigme*, *Duchesse bleue*. Two of the principal writers in the two domains of the naturalistic and the psychological novel are the genial Alphonse Daudet and Edouard Rod. They allow a touch of human feeling to animate their books, and therefore, although in some respects perhaps inferior from the artistic point of view, enjoy much favor with the bulk of the public. It is not always possible to decide whether an author belongs to one or the other of these two schools; this is, for instance,

the case with Ferdinand Fabre, and with novelists like Edmond About, or Cherbuliez. The extreme theories of Naturalism were soon given up. Five disciples of Zola—Rod among them—published a protest against their former master's conception of literature. Zola himself, in his *Trois villes* (*Lourdes*, *Itome*, *Paris*), renounced his pessimistic views of humanity, and in his four *Évangiles* (*Fécondité*, *Travail*, *Vérité*, *Justice*), of which only three had been written at the time of his death, the note of optimism and even of Utopianism is dominant. If Naturalism has died out, it has, however, left noticeable traces in the works of novelists up to the opening of the twentieth century. The brothers Rosny and the brothers Margueritte are almost direct descendants of Zola, with a slightly more pronounced tendency toward moralizing, while Maurice Barrès and Paul Adam, and L. Descaves discuss not only social but political issues. Again a tendency to use the psychological method is manifest in authors like Prévost, 'Gyp,' Estaunié, Mirabeau, and Hervieu. Theuriet, Bazin, and Pouvillon are realistic novelists of rustic life. The master of the naturalistic short story is Guy de Maupassant. Some view him as a greater writer than Zola himself. His sober style seems to be an improvement even upon that of Mérimée, who was usually considered the incomparable model in this field. The stories of Coppée may be mentioned here as belonging to the realistic style, tempered by deep sympathy with the working classes. Masson Forestier represents with talent the detective story. The names of Villiers de l'Isle Adam, Rémy de Gourmont, P. Louÿs, de Rémier offer the best examples of novels written by the modern Symbolists.

As to the stage, since the fight of Romanticism, we record the appearance of the prolific Scribe, and the original note struck by Alexandre Dumas, the son, and E. Augier, in their realistic, and at the same time hortatory, social dramas (*Dame aux camélias*, *Demi-monde*, *Fils naturel*, *Affaire Clémenceau* by the former, and *L'aventurière*, *Le fils de Giboyer*, *Maître Guérin* by the latter). They were the forerunners of realism in the drama. For years Labiche, Sardou, Meilhac, Halévy, and Pailleron contrived clever novelties to amuse the stage-goers. Meanwhile the theatrical ventures of Zola and Daudet had failed, and it was not until 1882 that Naturalism scored a triumph with *Les corbeaux*, by H. Becque. The success was, however, of short duration, for Naturalism degenerated soon into what has been called 'le théâtre rosse.' Since that time all sorts of plays have appeared on the Parisian stage; satirical by Lavedan and Donnay, social and moral by Curel, Hervieu, and Brieux. The most popular playwright has been E. Rostand. His *Romanesques* was a belated satire on Romanticism; in *Cyrano de Bergerac*, his greatest success, the satiric and serious elements are mixed in a most disconcerting manner; while *L'Aiglon* is a more or less happy attempt at historical drama; a genre cultivated also by Hennique, Coppée and Sardou. Finally, we should mention a group of artists specially characteristic of an epoch in which anti-naturalism is the dominant note: the Symbolists Villiers de l'Isle Adam, Saint Pol Roux, P. Claudel, and above all, Maeterlinck. The latter, however, has entered a more usual path in his *Monna Vanna* (1902). A resur-

rection of the Middle Ages, fashioned on its miracle plays, has also taken place on the eve of the twentieth century, with M. Bouchor and Vicaire; the *Théâtre de l'Âme*, by Schuré, also has a half mystical note.

The poetry of the last third of the nineteenth century illustrates remarkably well the oscillations of the literary ideals during this period. The spirit of Naturalism has made a deep imprint on the devotees of the Muses known as the *Poètes du Parnasse* or *Parnassiens*. Banville and Th. Gautier insisted above all upon a very accurate and, in appearance, scientific verse construction; a pornographic inclination is evident in Baudelaire's *Fleurs de mal*, a pessimistic note in Leconte de Lisle, and a psychological tendency in Sully Prudhomme; while one notices in Coppée, Richpin, Mendès, the general desire to draw on the lower classes of society for artistic material. Only fifteen years after the publication of the first volume of the Rougon-Macquart series and twenty after the foundation of the Parnassian group, a host of new authors came to the front, and spared no efforts to shake off the yoke not merely of the poets of the time, but of Naturalism itself. Some of these men, though essentially poets, wrote at times in prose. They called themselves *Symbolistes*, or sometimes *Décadents*, which title, however, was originally a nickname. Instead of looking at things as the Realists had done, they declared that the world is essentially a subjective creation, and that therefore objects and thoughts are better represented and conveyed by means of symbols than by an accurate description. The true field for art is not reality, but the sphere of mobile, subtle sensations and feelings. Symbolism is individualism carried to its extreme limits. They adopted a special vocabulary and a special system of versification. The latter culminated in the *vers libre*, i.e. the verse where nothing but the artistic feeling of the poet decides as to rhythm, number of syllables, and rhyme. The Symbolists recognize as their leaders Paul Verlaine and Stéphane Mallarmé, both of them former adherents of the Parnassian School; the best known are, besides the two already mentioned, Rimbaud, H. de Régnier, Viele-Griffin and Stuart Merrill (both American by birth), J. Laforgue, J. Moréas, G. Kahn, R. Ghil, Paul Fort. An important group has been flourishing in Belgium, Maeterlinck, Verhaeren, and Rodenbach being the chief members. In some prose authors, such as Huysmans (a former pupil of Zola), and the Sar Peladan, who has created the order of the Chevaliers de la Rose Croix, related tendencies have assumed the character of a vague artistic mysticism. These authors never succeeded in altogether gaining their point, the mass of the public being unable to follow them in such exoteric compositions. Therefore the next move has been a return to theories more accessible to the average mind. Groups of young poets, one in Toulouse, the other in Paris, have led the way in this new direction. They are known under the name of *Naturistes*. They speak highly of Zola, but while his attitude toward nature was purely scientific, they endeavor to bring out also its poetical aspects. There is nothing new in this vague pantheism itself, however original it may look after the extreme tendencies of Naturalism and Symbolism. Saint Georges de Bouhélier, M. Le Blond, and L. Balzacette are the principal

Naturistes. Another group of seventeen authors has been formed still later; their ideals are the same as those of the school just mentioned, but they are more mature poets. Their first manifesto was issued in the fall of 1902. It is a collective publication: *Les Poètes de l'école française; la foi nouvelle*.

Thus the swing of the pendulum becomes quicker and shorter as sects and schools spring up and die away. In reality the twentieth century opens without any prevalent literary ideal; it cannot be said, however, that any kind of artistic manifestation is altogether lacking. The most representative Frenchmen at the close of the last century seem to be the novelist P. Loti, with his vague impressionism, and Renan and Anatole France, whose chief characteristics are a refined dilettantism and amiable skepticism.

History in the second half of the nineteenth century has assumed a more and more scientific form of treatment, with Fustel de Coulanges, Renan, Taine, Lavisse, Sorel, and it is considered by many, probably with reason, as belonging no longer to the domain of literature. The same question has even been raised with regard to criticism. Since the admirable work of Villemain, D. Nisard, and especially Sainte-Beuve, there has been a strong inclination toward scientific criticism. Taine, and with a kind of fanaticism Hennequin, systematized it to such an extent as to make it render well-nigh automatic judgments. The reaction was not long in setting in. The two methods in vogue in the last decade of the nineteenth century were that of the dogmatist, like Brunetière and Doumic, who judge works of literature according to their agreement with an objective canon, and that of the impressionists, like Lemaitre and A. France, who allow themselves to be guided solely by their subjective feeling of the beautiful. Critics such as Faguet, Larroumet, Lanson, Pellissier, may be called intellectualists; they aim at impartiality, and support their opinions with rational motives. Among the rising stars in criticism in the first years of the twentieth century must be mentioned: C. Maclair, A. Beaunier, for their openness to new ideas, and E. Charles for his energetic and independent criticism.

We ought to speak before ending of a deep but almost unconscious conflict, independent of any artistic standard, between two classes of authors—those who endeavor to make literature conform to the tastes of the masses, thus yielding to the democratic spirit of the nineteenth century, and those who try to resist these efforts. Authors like Hugo have been frequently accused of pandering to the popular taste. The great successes in this low order of literature have lain in the domain of the novel. Foremost in this style is Dumas, the elder, whose *Monte Cristo* and *Three Guardsmen* are familiar to all English readers. Next to him, though not so famous, are men like P. de Kock, E. Sue, A. Karr, Ponson-du-Terrail, Gaboriau, Richebourg, X. de Montépin, Saintine, Souvestre, O. Feuillet, and G. Ohnet.

On the stage a deliberate step toward popular art has been taken by M. Pottecher, who has created in 1895 his 'Théâtre du peuple' at Bussang, in the Vosges. He has found many imitators at Gérardmer, Ploujean, Béziers, and other towns of France. The advisability of establish-

ing a similar institution in Paris has been discussed at length by the great French periodicals.

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FRENCHMAN'S BAY. An ocean inlet in Hancock County, Maine, extending inland about 25 miles, with a width in some places of 10 miles (Map: Maine, G 7). Mount Desert Island forms the western side of the bay, and Bar Harbor, the most prominent resort on this island, is situated on its shore. It furnishes numerous good harbors, and contains a number of islands, chief of which are the Porcupine, Iron Bound, Jordan, Stave, Calf, and Hancock islands.

FRENCH POLITICAL PARTIES. See POLITICAL PARTIES, section on FRANCE.

FRENCH PROPHETS. A name given in England to certain Camisards (q.v.), who came thither from France in 1706, making extravagant claims of prophecy, the gift of tongues, ability to work miracles, etc. They preached communistic doctrines and announced the speedy coming of the Messiah's kingdom. For a short time they gained converts, including some persons of influence. Consult David Hughson (i.e. Edward Pugh), *A Copious Account of the French and English Prophets* (London, 1814).

FRENCH PROTESTANT CHURCH. See HUGUENOTS.

FRENCH REVOLUTION, THE. The Revolution of 1789 in France which overthrew the Bourbon monarchy and the old feudal régime. In this article the name is employed for the period of French history beginning with the meeting of the States-General at Versailles, in 1789, and ending with the establishment of the Consul-

ata, in 1799. For an account of the condition of France before the Revolution, and the causes that brought it about, see FRANCE.

When it was decided to summon the States-General, two important constitutional questions required solution—the distribution of representation among the three orders, and the method of voting in the States-General itself. Owing to the somewhat irregular character and procedure of this body, which had not met since 1614, there were no valid precedents which could be followed in 1789. In solution of the first question, a royal decree revived or created certain electoral divisions, and provided for the election of 250 delegations of four members each—one from the nobility, one from the clergy, and two from the Third Estate—thus dividing the membership of the States-General equally between the two upper orders and the Third Estate. Supplementary decrees provided for special cases which arose and considerably increased the number of members. In each electoral district, in conjunction with the election of the members of the States-General, each of the three orders drew up *cahiers*, or lists of grievances, including propositions for new legislation. The question of the method of voting was left unsolved, but the official expectation was that the vote would be by order, which would have required a majority vote of each of the orders to pass any measure. This would have been a bar to any vital measure of reform. The Third Estate, however, expected and intended to have a vote by head; that is, the three orders should vote as one body, and the simple majority should suffice to pass any measure. This would have placed the control in the hands of the Third Estate, which would vote as a unit, and could depend upon the support of a few liberal nobles and the considerable number of parish priests among the representatives of the clergy. When the States-General met, the nobility and the clergy organized as separate houses, but the Third Estate refused to take any such action, in spite of royal and ministerial pressure, and finally on June 17th declared themselves the National Assembly, and invited the nobility and clergy to take their own places in the Assembly. When the Third Estate first met on June 20th, they found their meeting-hall closed, but secured a place of meeting in the building called the Tennis Court (*jeu de paume*), where they took the famous oath not to dissolve until they had given France a constitution. The parish priests or *curés* and a few of the liberal nobles then joined the Third Estate. After the fruitless royal session of June 23d, in which the King commanded the three orders to meet separately, the remainder of the nobility and clergy, at the royal bidding, joined their fellows in the National Assembly, which came to be called the Constituent Assembly, because of its self-imposed task of framing a constitution. The leader of the Third Estate for the vote by head was Mirabeau (q.v.), an able but discredited noble who had secured an election as a representative of the Third Estate for Aix.

In July, under the influence of a few ultra-conservative and reactionary members of the royal family and of the nobility, the King assumed a hostile attitude, dismissed Necker, the Minister of Finance, in whom the hopes of a regenerated France largely centred, and concentrated troops on Paris. Insurrectionary move-

ments, by which the masses of the people began to show their interest, broke out in Paris. Blood was shed in the capital on July 12th, and on the 14th the Bastille (q.v.), the visible sign of generations of tyranny, was stormed and partially destroyed. The propertied classes and the business people of the city, to prevent the recurrence of bloodshed and riot, and to maintain order, organized a city militia, called the National Guard, and a provisional city government. The King, in alarm, withdrew the troops, recalled Necker, and in response to popular demand visited Paris, where he legalized the provisional measures, and recognized Lafayette as Commandant General of the New National Guard, and the astronomer Bailly as Mayor of Paris, and changed the national colors from the white of the Bourbons to the new and popular tri-color.

Having failed in their attempt to overawe the National Assembly and the people of Paris, the Count of Artois, the King's youngest brother, and other leading reactionaries left France, being the first of the so-called *Émigrés* (q.v.). Immediately following the capture of the Bastille, local disturbances broke out in many sections of the country, while other parts were swept by a panic, known as the "Great Fear." The old administrative machine had broken down, and the nation was without an effective local government. In each locality the cool-headed lovers of law and order organized companies of the National Guard, and established a provisional local administration.

On the night of August 4th a report on the condition of the nation was read in the Constituent Assembly by one of the Deputies, Salomon. This report was followed by the abolition of the old feudal and manorial privileges. The Assembly did not begin at once the necessary constructive work, but dallied with academic discussion on the rights of man, a declaration of which was adopted, to be a preface to the new Constitution. (See ASSEMBLY, NATIONAL.) The King and his ministers failed to show any ability to deal with the crisis, while the attitude of the Queen and the Court gave color to rumors and popular fears concerning the hostile designs of the King against reforms. This period of suspense was ended by another outbreak in Paris. A mob, composed largely of hungry women, after some disturbances in the capital, marched to Versailles on October 5th, followed by Lafayette and the National Guard. Lafayette rescued the royal family, but did not disperse the mob, and on the following day the National Guard and the mob escorted the royal family to Paris and quartered them in the Tuileries. The Constituent Assembly soon followed and found a meeting-place near the Tuileries. Thus far, the Assembly had been dominated by admirers of the English Constitution, like Mounier and Mirabeau, and by admirers of America, like Lafayette and the Lameths. Although there were some theoretical admirers of republican institutions, still, in practice, all had contemplated a constitutional monarchy for France. Now, the most conservative members of the Assembly began to disappear, and slowly more liberal principles developed. A symptom of this change was in the organization of clubs, the earliest and most important of which was the Society of the Friends of the Constitution, later known as the Jacobins (q.v.), from the old monastery in which its meetings

were held. The Jacobins became a great political force, because of their system of affiliated clubs in the provinces, with which they were in close communication. (See FEUILLANTS; JACOBINS.) Another important club in Paris was the Cordeliers (q.v.), under the radical leadership of Danton. Newspapers, as well as clubs, sprang into existence in 1789, for the censorship ceased to discharge its functions. These papers differed widely in form, regularity of issue, and character. In general their purpose was political and most of the space was occupied with accounts of the sessions of the Constituent Assembly. The most famous of the journals was the *Moniteur*; the most brilliant was the *Révolutions de France et de Brabant* of Camille Desmoulins, and the most erratic the *Ami du peuple* of Marat. On November 2d, the Assembly decreed the transfer of the property of the Church to the nation. In February, 1790, it abolished succession by primogeniture. In June, it suppressed all titles of nobility.

The work of drawing up the new Constitution went on apace in the Assembly, so that the first draft was accepted by the King on July 14th, 1790, the anniversary of the taking of the Bastille, at the Feast of the Federation in the Champ de Mars, in which representatives from all parts of the country participated. The Constitution gave the King a suspensive veto on all measures passed by the unicameral national legislature. The legislature shared with the King the control of foreign affairs. The most successful and most enduring portion of the new Constitution was the provision made for the reorganization of France into 83 departments, each with its local administration. All officials were to be elected by the people. Another feature of the new arrangements was equally important because of the opposition which it aroused. This was the Civil Constitution of the Clergy, which reorganized the Church upon the lines of the new civil administration and transferred the actual control of the Church from the hierarchy to the French State. The clergy were to be paid by the State and were required to take an oath to support the new arrangement. This caused a schism in the Church in France, because two-thirds of the priests remained loyal to the Catholic Church and refused to take the oath. The Assembly had already confiscated the estates of the Church and issued assignats (q.v.), or a kind of Government notes based upon these lands as security. The confiscated lands, comprising one-fifth of France, being thus placed suddenly upon the market, depreciated rapidly in value, and the assignats, owing to new issues, declined more rapidly. The only other important event of the summer of 1790 was the military mutiny at Nancy and its suppression by Bouillé (q.v.) on August 31st. Necker, to whom, of all the King's ministers, the nation had looked for wise and able measures, failed to accomplish anything, and retired from office in September, 1790, leaving the King without a single competent adviser. Mirabeau was the one man in public life who possessed real statesmanlike ability. Though viewed with suspicion by his colleagues in the Constituent Assembly, and with unconcealed contempt by the Queen and the Court, he attempted to place his talents at the service of the nation, through both the Assembly and the King. Though his advice was not accepted, the nation realized that his death, on April 2d, 1791, left France without a

single statesman to guide her. Worst of all, France was not to be allowed to solve her problems alone. The Queen was in constant correspondence with her brother, the Emperor Leopold II., the ruler of the extensive Hapsburg dominions. This was regarded by the people as treasonable. Both Leopold and Frederick William II. of Prussia regarded the events in France with suspicion, and desired to save the French royal family from humiliation and possible danger. German rulers had allowed the increasing numbers of the émigrés to gather within their territories, and threaten armed invasion of France to rescue the royal family and restore the old order. Contrary to the advice which Mirabeau had given, the King and his family escaped from Paris on the night of June 20, 1791, and fled toward the eastern frontier to take refuge with the émigrés under the protection of the Emperor Leopold. This confirmed the popular suspicion that the Queen was in treasonable correspondence with her brother, and that the King had perjured himself in swearing to support the new Constitution. The King and the royal family were halted at Varennes and brought back to Paris.

The summer of 1791 witnessed two unfortunate events which foreshadowed the evil days to come. The first was the unprovoked firing upon a popular meeting in the Champ de Mars, in Paris, on July 17th—an event known as the Massacre of the Champ de Mars. The other was the meeting at Pillnitz of Leopold II. and Frederick William II. in August, and the issue of a joint declaration intended as a warning to the popular party in France. Meanwhile the Constituent Assembly had revised the Constitution on more conservative lines and submitted the completed work, the Constitution of 1791, to the King, who took the oath to it on September 14th. A new legislature having been chosen according to the provisions of the new Constitution, the Constituent Assembly dissolved on September 30, 1791.

The new legislature, known in history as the Legislative Assembly, began its sessions on October 1, 1791. The Assembly was composed of about 750 members, chosen largely from the middle class, and included no one who had sat in the Constituent Assembly. There were no organized parties in the Legislative Assembly; but two small groups, one liberal and one radical, early came into prominence—the Girondists (q.v.), so named because their leaders came from Bordeaux in the Department of the Gironde; and the Mountain, who took this name because they occupied the highest seats on the left side of the hall. The majority of the members of the Assembly were moderates or even conservatives, but the Girondists were generally able to carry their measures. Unfortunately, the Girondists were theorists and orators, and included among their number no person of statesman-like character. Under the leadership of Brissot they became a republican party, and monarchy gradually became unpopular. Differences in regard to the nature of the proposed republic later arose between the Girondists and the Mountain, the one desiring a federal republic like the United States, the other advocating a republic one and indivisible with a centralized administration. The Legislative Assembly enacted stringent measures against the émigrés and the priests who refused to take the oath to support the Civil Constitu-

tion of the Clergy. Failing to see that France needed peace in order to complete the solution of her internal questions and to establish a stable form of administration, the Girondists after prolonged discussions secured the passage, on April 20, 1792, of the fatal act declaring war against Prussia and Austria.

Lack of discipline was largely responsible for the failure of the French armies to keep the Austrians and Prussians out of France. The advance of the foreign armies increased the unrest in Paris. Small politicians began to form an organization to use the mob of Paris as a political force. On June 20th they directed a demonstration by the mob, which resulted accidentally in an invasion of the Tuileries. The knell of French monarchy had sounded. King, ministers, and legislators sat helpless awaiting the final blow, while the leaders of the mob quietly but without concealment matured their plans. They usurped the government of Paris, organizing a revolutionary commune. Volunteers were sent to the armies, while others were brought to Paris from Brest and Marseilles, the latter entering Paris singing the patriotic hymn henceforth known as the *Marseillaise*. On July 25th the Duke of Brunswick, who commanded the Austro-Prussian Army which was preparing to invade France, issued a proclamation against the French Revolutionists which aroused the Parisians to frenzy. On August 10th all was ready and the revolutionary leaders struck their blow. The Tuileries was stormed and the Swiss Guard was massacred. The royal family took refuge in the hall of the Legislative Assembly, which suspended the King and placed the royal family under strict surveillance in the Temple. A national convention to revise the Constitution was called, to be elected not on the restricted franchise provided in the Constitution of 1791, but by universal manhood suffrage. Numerous suspects were arrested, and Danton as Minister of Justice acted virtually as dictator. Lafayette in alarm abandoned his army and fled from France, but was seized and imprisoned by the Austrians. Further losses on the frontier resulted in further disturbances in Paris, culminating in the massacres of September, during which about 1000 royalists and non-juring priests in the prisons were slain by the mob. Popular outbreaks also took place in some of the provincial cities. The tide of disaster and disorder was stemmed by the news of the engagement of Valmy on September 20th, between Kellerman and the Duke of Brunswick who vainly cannonaded the French position. On the same day the Legislative Assembly ended its sessions.

The National Convention, composed of about 750 members, nearly 500 of whom were new men, met on September 21st, and promptly showed its character by abolishing the monarchy and declaring France a republic. The first weeks of the Convention were marked by the occupation of Savoy and Nice, the successes of the French armies on the Rhine, and the victory of Dumouriez over the Austrians at Jemappes (November 6). In December the King was brought to trial, and called upon to answer for alleged acts of treason against the nation. Sentence of death was passed upon him, and on January 21, 1793, he was beheaded. The division of parties, which had been noticeable to some extent in the Legislative Assembly, became marked in the Convention. The Girondists

in the beginning possessed a decided majority, but as the party of moderation they showed themselves less able to cope with the many dangers that beset revolutionary France than the thorough-going members of the Mountain. As the representatives, too, of the higher bourgeoisie they were destined to fall before the fierce champions of democracy. The downfall of the Girondist influence began with the trial of Louis XVI., when, against their will, they were compelled to vote to sentence the King to death.

On the frontiers, the year 1793 opened with a series of disasters, which emphasized the folly of the declaration on February 1st of war against Great Britain, the Protestant Netherlands and Spain. Successive defeats were reflected at Paris in successive measures of a vigorous and revolutionary character. Early in March eighty-two members of the Convention were dispatched to the different departments to raise 300,000 troops, and at Paris a Revolutionary Tribunal was established for the speedy trial of persons deemed guilty of crimes against the nation. The defeat of Dumouriez (q.v.) at Neerwinden on March 18th, and the desertion of that general to the Austrians, were followed in April by the establishment of an executive committee of the Convention, the first Committee of Public Safety, which under the leadership of Danton wielded dictatorial powers of government. Civil war was already developing in France because of the resistance of the Catholic and royalist peasants of the Vendée and neighboring departments in Western France to the levy of the 300,000 troops. Up to this time, April, 1793, the Girondists had shared responsibility for every measure of a revolutionary character and had themselves created the instruments of their own overthrow and destruction. But ever since the early weeks of the Convention the Girondists and the Mountain had been engaged in a life and death struggle, whose end was hastened by the terrible dangers which beset France. Hostile armies had crossed the frontier and were pressing toward Paris. Within was civil war. In the words of Danton, audacious measures were necessary. Danton and the Mountain were prepared to take them. The Girondists wanted to debate when delay was treason. The Girondists were overthrown on June 2d, and their leaders expelled from the Convention and placed in custody. The revolutionary commune of Paris, which contained the most radical individuals in power during the Reign of Terror, was placed on a legal footing. In the meanwhile the Deputies on mission were working with patriotic ardor in the provinces, and thirteen armies were organized, equipped, and maintained in the field to serve against foes abroad and at home. A democratic constitution, the Constitution of 1793, was speedily drawn up and promulgated, but it never went into actual force. The Committee of Public Safety ruled France from July, 1793, to July, 1794. In conjunction with the Committee of General Security in charge of the police administration, it saved France, though at the expense of the Reign of Terror.

The Great Committee of Public Safety apportioned its work to the different members. Carnot and Prieur of the Côte d'Or dealt with the questions of military strategy and the supply of arms and ordnance; Lindet and Prieur of the Marne had charge of the provisioning of the

cities and the armies; Jeanbon Saint-André looked after the navy; Billaud-Varenne and Collot d'Herbois were charged with the internal administration and were the real managers of the Terror; Barère and Saint-Just were the spokesmen of the Committee in the Convention; while Robespierre, as the only member with a reputation, did little work, but was a figurehead who received all the glory and later all the blame for the acts of the Committee as a whole. The services of Robespierre, though not very material, were none the less real, because, hiding behind his great personality, the workers were able, unquestioned and unhampered, to save France. The Great Committee carried out the internal administration by sending out members of the Convention as deputies on mission to the different departments to control and direct the revolutionary authorities established in each locality. Bluster, terror, imprisonment, and a few executions kept most of the departments in order. War and measures of a harsher character were employed against the royalist and Catholic uprisings in the Vendée and Brittany, and against the Girondist insurgents in Caen, Lyons, Marseilles, Toulon, and Bordeaux. Popular indignation against the Girondists became more bitter after the assassination of Marat (July 13th) by Charlotte Corday, at the instigation, it was thought, of the Girondists at Caen. By the end of 1793 the Girondist rising had all been suppressed and the leaders, including twenty-one deputies to the Convention, executed. The Vendéans were completely defeated, but continued to carry on a guerrilla warfare until 1800. Nantes, the largest city in the Vendean country, was the headquarters of the infamous deputy on mission Carrier (q.v.), who executed more victims than did his colleagues in all the rest of France. At Paris, Fouquier-Tinville (q.v.) and the Revolutionary Tribunal sent about twenty-six hundred persons to the guillotine, including nearly all of the notable victims of the Revolution from Queen Marie Antoinette down to the unsuccessful generals and the non-juring priests. It is worthy of notice that the number of victims during the Reign of Terror has been greatly overestimated, and that more Frenchmen perished in single battles under Napoleon. The greatest sufferer during the Terror was the Catholic Church, which had to expiate its abuses during the Ancien Régime, and to suffer for its refusal to accept the Civil Constitution of the Clergy. The opposition to the Church culminated in the spasmodic establishment of the Worship of Reason, marked by the Festival in Notre-Dame at Paris on November 10, 1793. Danton and Robespierre recoiled from such desecration, and the Worship of Reason gradually died out. Later Robespierre tried to establish the Worship of the Supreme Being, and inaugurated the new cult by the Festival of the Supreme Being on June 8, 1794. With the introduction of the Revolutionary Calendar in October, 1793, weeks were replaced by decades, and the observance of the Christian Sabbath and of saints' days instead of the *decadi*, and the revolutionary festivals became a criminal offense. These revolutionary festivals were celebrated in Paris with great pageants under the direction of the painter David. The measures of the Government of the Terror were not alone destructive and revolutionary, such as the Law of the Suspects and the Law of the Maximum, establishing fixed prices for commodities and wages, but in-

cluded much of a constructive nature. The bases of the civil and criminal codes were the work of the committees of the Convention. Another committee devised the system of national education, afterwards slightly modified and established by Napoleon. The military committee under Dubois-Crancé effected the reorganization of the army. The metric system and the French decimal currency were among the other creations of the Convention.

The suppression of civil war and the establishment of internal order permitted the use of all the nation's resources against the foreign foe, and a succession of victories planned by Carnot and made possible by the labors of his colleagues soon began to reward the efforts of the Great Committee of Public Safety. Beginning with the successes of Jourdan at Wattignies (October 16, 1793), and of Pichegru at Weissenburg in December, the invaders were driven out of France, and the French armies were able in the spring of 1794 to take the offensive. The series of victories was crowned by Jourdan in the capture of Charleroi and the defeat of the Austrians at Fleurus (June 26, 1794). Thus not only at home, but also against the foreign foe, the Government of the Terror had justified itself.

The Revolution, however, was destined, Saturn-like, to devour its offspring. Robespierre and the Great Committee of Public Safety felt that the circumstances compelled them not only to crush insurrection and revolt, but also to silence any questioning of their policies and acts. On the one hand, Hébert, Chaumette, and the other leaders of the Commune of Paris were more radical than the Great Committee, and incurred the dislike of Robespierre, because of their devotion to the Worship of Reason, and because of the indecent character of the *Père Duchesne*, a series of political tracts published by Hébert. On the other hand, the Great Committee and Robespierre feared Danton, who had begun to suggest that the Terror had gone far enough. Robespierre and the Committee acted with promptness and vigor. The Hébertists were executed on March 24, 1794, and the Dantonists on April 5th. After the death of Danton, Robespierre seemed to be supreme, and at his bidding the Revolutionary Tribunal worked more speedily, and sent daily to the guillotine almost as many victims as it had previously done in a week. The Terror was at its height, but the fullness of time had come. The victory at Fleurus rendered further terroristic measures unnecessary. Furthermore, foes of Robespierre began to see that they stood in the way of the coming of his expected reign of peace and virtue, and so were troubled for their own safety. Among these were even members of the Great Committee, who conceived the idea of making Robespierre the scapegoat for their deeds. The plot was laid, and on July 27th the blow fell. Robespierre and his two friends in the Great Committee, Couthon and Saint-Just, and others of his followers were ordered under arrest and executed on July 28th and the following days. This was the Revolution of the Ninth of Thermidor and the end of the Reign of Terror.

The remaining fifteen months of the Convention were a period of reaction. The Committee of Public Safety, with a changing membership, continued to direct the administration; but the Revolutionary Tribunal was dissolved, the Law of the Maximum was repealed, the deputies ceased to go on mission, and the Jacobin Club,

which had been so closely identified with the Terror, was closed. Girondists and Conservatives who had withdrawn from the Convention or had been expelled were recalled. Until the close of 1794 the Convention and the Committee of Public Safety were controlled by the Thermidorians, the men who had overthrown Robespierre. During the winter of 1794-95 they were superseded by the returning Conservatives and Girondists, who devoted the last months of the Convention to an attempt to obtain revenge for their sufferings during the Terror. On April 1, 1795 (12 Germinal), and on May 20 (1 Prairial) bread riots broke out in Paris and the insurgents clamored for a restoration of the "red republicanism" of 1793. Both insurrections were crushed; the great Terrorists, like Billaud-Varenne and Collot d'Herbois, were deported, and the survivors of the Mountain imprisoned, deported, or executed. This reaction, known as the White Terror, extended to the provinces, especially to Southern France, where the vengeance wreaked upon the Mountain was more bloody than the Terror itself. In the summer of 1795 the Convention performed the task for which it had been elected in the summer of 1792, and drew up a new constitution called the Constitution of the Year III. The closing months of the Convention were marked by an unbroken series of military successes, and by the first efforts toward the restoration of peace. The United Provinces were occupied by Pichegru and organized as the Batavian Republic under French protection; and the French Minister in Switzerland signed at Basel treaties of peace with Tuscany, Prussia (April 5, 1795), Saxony, Hanover, Hesse-Cassel, and Spain (July). France remained at war with Sardinia, England, Austria, and the Empire.

The Convention was not to close without one more insurrection in Paris—that of the 13th Vendémiaire (October 5, 1795), in opposition to the new Constitution. This rising was quelled by Barras with the aid of Napoleon Bonaparte. The Convention came to an end on October 26, 1795, and was replaced by the Directory, the Government established by the Constitution of the Year III. The executive authority was vested in a committee of five Directors, and the legislative power was exercised by two houses, the Council of the Ancients and the Council of Five Hundred. By order of the Convention the first Directors and two-thirds of the first Legislature were to be chosen from the members of the Convention. One member of the Directory and one-third of the Legislature were to retire annually, beginning in May, 1797. The new Constitution had one fatal fault; it made inevitable a deadlock between the Executive and the Legislature, and provided no means of breaking it except by revolution. Such a deadlock occurred after the elections of 1797, and was met by three of the Directors, Barras, Larévellière-Lépeaux and Reubell, who, by the coup d'état of 18 Fructidor (September 4), expelled their colleagues, Carnot and Barthélemy, and a large number of the members of the two Councils, thus preventing the triumph of the party of reaction which had won in the elections. The reverse happened in the coup d'état of 30 Prairial (June 18, 1799), when the Councils asserted themselves and seized control of the Executive, under the leadership of Sieyès. The Directors were assisted in the conduct of the central Government by a Ministry,

which at one time or another included such able men as Talleyrand, Fouché, and Merlin of Douai. The local administration was conducted in an arbitrary manner by national agents appointed by the central Government. The Government was corrupt, and the reckless management of the finances would have ruined the nation had its coffers not been enriched by the plunder of Italy, sent home by Bonaparte. The measures against the émigrés and the non-juring priests lost little of their harshness. Though the worship of Reason had been forgotten, the attempt to give France civil religion continued, and new religions, like 'Theophilanthropy,' were devised and became the fad of the moment. Society, under the influence of the brilliant and dissolute Barras, the most important of the Directors, was corrupt, irreligious, and dissolute. In short, little of importance and nothing of credit marked the internal history of the Directory, and only by the success of its military policy did it justify its existence. In Italy Bonaparte crushed Sardinia and forced her to accept peace, and in a series of campaigns of unsurpassed brilliancy drove the Austrians out of Italy, marched on Vienna, and forced the Emperor, Francis II., to sue for peace, which was concluded at Campo Formio, October 17, 1797. In Southern Germany, Hoche and Moreau had conducted equally glorious but less successful campaigns against the Austrians. Bonaparte refused to invade England, the one remaining enemy of France, and was encouraged by the Directors who feared him in carrying out his scheme of conquering Egypt as a step towards destroying England's power in India. In spite of his victories the campaign was a failure. The English fleet under Nelson destroyed the French fleet in the battle of the Nile (August 1-2, 1798), and held control of the Mediterranean. Meanwhile, freed from the fear of Bonaparte, the enemies of France once more assumed the offensive. Austria broke the Treaty of Campo Formio, and, in alliance with England and Russia, renewed the war. The combined Austrian and Russian armies, by the victories of Suvaroff at the Trebbia (June 17-19, 1799), and at Novi (August 15, 1799), drove the French into Genoa. The reverses of the French arms and the evil internal conditions caused discerning men like Sieyès, Fouché, and Talleyrand to turn to Bonaparte as the possible savior of France. In response to their invitations he returned from Egypt, and by the coup d'état of 18 Brumaire (November 9, 1799) overthrew the Directory and the Councils, and established a Provisional Government, consisting of himself, Sieyès, and Roger Ducos as Consuls. A new constitution, the Constitution of the year VIII., was drawn up, establishing the Consulate, with Bonaparte as First Consul; Cambacérès, Second Consul; and Lebrun, Third Consul. A Tribunal was to debate proposed laws, which were to be voted upon without debate by the Corps Législatif. Practically, the First Consul was dictator, with absolute powers.

PRIMARY AUTHORITIES. The files of newspapers, such as the *Moniteur*; the memoirs of contemporaries, such as those collected by Berville, Barrière, and Lescuré; volumes in the *Collection des documents inédits sur l'histoire de France*, such as Aulard, *Recueil des actes du comité de salut public*; Brette, *Recueil des actes relatifs à la convocation des Etats généraux de 1789*; and

Guillaume, *Procès-verbaux du comité d'instruction publique*; the volumes of the *Collection des documents relatifs à l'histoire de Paris pendant la Révolution française*, such as Aulard, *La société des Jacobins*, the publications of the *Société d'histoire de la Révolution française*, and the *Société d'histoire contemporaine*; the legislative proceedings as given in Buchez and Roux, *Histoire parlementaire*, and Mavidal and Laurent, *Archives parlementaires*; and numerous other publications, such as Kaulek, *Papiers de Barthélemy*, may be mentioned as the most accessible and useful. Special bibliographies on the French Revolution are: Tourneux, *Bibliographie de l'histoire de Paris pendant la Révolution française*, and a portion of the *Catalogue de l'histoire de France à la bibliothèque nationale*. The best short accounts are: Mignet, *Histoire de la Révolution française* (1st ed., Paris, 1824); Rose, *Revolutionary and Napoleonic Era* (New York, 1897); Morse-Stephens, *Europe, 1789-1815* (New York, 1893). The best product of modern scholarship is Aulard, *Histoire politique de la Révolution française, 1789-1804* (Paris, 1901); the best in English, though at present ending at 1793, is Morse-Stephens, *History of the French Revolution* (2 vols., New York, 1886-91). Of the more famous works, Carlyle, *French Revolution* (1st ed. London, 1837), is a literary appreciation; Thiers, *Histoire de la Révolution française* (1st ed. Paris, 1823-27), is now useful only for the Directory; Quinet, *La Révolution* (1st ed. Paris, 1885), and Taine, *La Révolution* (1st ed. Paris, 1878-85), are philosophical and psychological rather than historical studies; Michelet, *Histoire de la Révolution française* (1st ed. Paris, 1847-53), is the most brilliant literary history in French. There are English translations of Mignet, Thiers, Michelet and Taine. Though differing widely in method, bias, and value, the most useful special works are, for international relations: Sybel, *Geschichte der Revolutionszeit von 1789 bis 1800* (5 vols., Düsseldorf, 1853-74; English translation to 1795, London, 1867-69); Bourgoing, *Histoire diplomatique de l'Europe pendant la Révolution française* (3 vols., Paris, 1865-71); Sorel, *L'Europe et la Révolution française* (4 vols., Paris, 1885-92); for military affairs: Jomini, *Histoire critique et militaire des campagnes de la Révolution de 1792 à 1801* (3d ed., 15 vols., and 4 atlases, Paris, 1819-24); Chuquet, *Les guerres de la Révolution* (11 vols., Paris, 1886-1895); Jung, *L'Armée et la Révolution: Dubois-Crancé* (2 vols., Paris, 1884), and *Bonaparte et son temps, 1769-1799* (3 vols., Paris, 1880-85); for naval affairs: Mahan, *Influence of Sea Power upon the French Revolution and Empire, 1793-1812* (2 vols., Boston, 1892); Chevalier, *Histoire de la marine française sous la première république* (Paris, 1896); for the Emigrés: Forneron, *Histoire générale des émigrés pendant la Révolution française* (3d ed., 2 vols., Paris, 1884); for internal affairs: Aulard, *L'éloquence parlementaire pendant la Révolution française* (3 vols., Paris, 1882-86); Mortimer-Ternaux, *Histoire de la Terreur* (8 vols., Paris, 1862-81); Wallon, *Histoire du tribunal révolutionnaire de Paris* (6 vols., Paris, 1880-82), *La Révolution du 31 mai et le fédéralisme en 1793* (2 vols., Paris, 1886), and *Les représentants du peuple en mission et la justice révolutionnaire dans les départements en l'an 2* (5 vols., Paris, 1889-90); Sciout, *Le*

Directoire (2 vols., Paris, 1895, in publication); for the finances: Stourm, *Les finances de l'ancien régime et la révolution* (2 vols., Paris, 1885); for religious affairs: Sciout, *Histoire de la constitution civile du clergé* (4 vols., Paris, 1872-81); Aulard, *Le culte de la raison et le culte de l'Être suprême* (Paris, 1892); for society: Goncourt, *Histoire de la société française pendant la Révolution* (Paris, 1854), and *Histoire de la société française pendant le Directoire* (Paris, 1855); for the Vendean War: Chassin, *La préparation de la guerre de Vendée* (3 vols., Paris, 1892), *La Vendée patriote* (4 vols., Paris, 1893-95), and *Les pacifications de l'Ouest* (3 vols., Paris, 1898-99).

FRENCH RIVER. A stream in Ontario, Can., emptying Lake Nipissing into the Georgian Bay of Lake Huron, after a course of 55 miles (Map: Ontario, C 2). It is noted for its magnificent scenery, and for 150 years was the regular route to the Upper Lakes.

FRENCH RYE GRASS. See *ARRHENATHE-RUM*.

FRENCH SETTLEMENTS. The French colonies of Pondicherry, Chandernagar, Karikal, and Mahé (q.q.v.) in India.

FRENCH SHORE. See *NEWFOUNDLAND*.

FRENCH SOMALILAND, sô-mä'lê-länd. A possession of France in Northeast Africa, on the west shore of the Gulf of Aden; bounded on the northwest by Eritrea, on the west and southwest by Abyssinia, and on the southeast by the British Somaliland Protectorate (Map: Africa, J 3). The area of the French Somali Protectorate proper is almost 5000 square miles; with the dependencies, the area is estimated at 45,000 square miles. The coast is generally hilly. The interior is practically a plateau, with an average elevation of about 4000 feet, and sloping from northwest to southeast. Almost without industries of any kind, the country has, however, a trade of some importance, owing to the sea fisheries and the traffic with the interior of the continent. In 1900 the imports reached a value of \$1,200,000, an increase of \$400,000 over 1899. The value of the exports is given at \$450,000 in 1899 and \$140,000 in 1900. Among the imports are cotton and silk goods, foodstuffs, and tobacco; among the exports are coffee, ivory, gold, and sheepskins. Most of the direct trade is with France. The Jibuti-Harar Railway has 100 miles open for traffic, and will bring a greatly increased trade from Abyssinia. The ports are in close communication with Aden by local boats. French and English vessels visit the coast regularly.

The country is, since 1899, administered by a Governor and by a General Council of six members, three chosen from Government officials, and three from the leading residents. In 1902 the French budget for the Somali coast was \$40,000. In 1900 the local budget was \$120,000. The population of the protectorate proper is about 22,000; with the dependencies added the population is estimated at 200,000. The natives belong to the Danakil and Galla races. The principal towns are Jibuti, a port since 1888, and now the seat of the colonial administration; Obok, with 15,000 inhabitants (2500 European), a port with post-office and telegraph; Tajurah, with 2000 people; and Ambado, Gobad, and Sagallo. Obok has been in possession of the French since 1855. In 1881

they began active operations in this region. They acquired Sagallo in 1883; Tajurah in 1884; and Ambado in 1888, in which year a port was created at Jibuti. In 1887 and 1891 the boundaries of the country were definitely fixed with England and with Italy, and in 1896 with Abyssinia on the west.

FRENCH SPOILIATION CLAIMS. Demands made upon the United States Government by American merchants for losses of ships and cargoes between 1793 and 1800 at the hands of the French, whose chief excuse for the depredations was that the United States had violated its pledges under the treaty of 1778. By the treaty of September 30, 1800, and by the convention of April 30, 1803, France released the United States from certain treaty obligations, and in return was released from paying the merchants' claims, the United States securing peace at the expense of her citizens. Between 1800 and 1885 some fifty bills to reimburse the claimants or their descendants came before Congress, and appropriations were twice voted, but were vetoed in each case by Presidents Polk and Pierce respectively. No redress was obtained until 1885, when the adjudication of the claims was given to the Court of Claims, and decisions were reached awarding some \$4,800,000 to the petitioners.

FRENCH SUDAN, sōō'dīn'. A name formerly used to designate the territory in Western Africa extending from about 12° W. longitude to Lake Chad, and from the Sahara on the north to the northern boundaries of the countries along the northern coast of the Gulf of Guinea (Map: Africa, D 3). French Sudan was divided up by a decree in 1899. The western portions of it fell to Senegal, French Guinea, the Ivory Coast, and Dahomey, and the rest was formed into the three military territories of French Sudan, all the foregoing possessions being under the administration of the Governor-General of French West Africa (q.v.).

FRENCHTOWN. A township in Monroe County, Mich., about 22 miles southwest of Detroit, formerly the name of a village on the site of the present Monroe. Here on January 14, 1813, during the second war between the United States and Great Britain, an American force of about 650, under Colonel Lewis, defeated a force of about 100 British, under Major Reynolds, and of about 400 Indians, under Round-Head and Walk-in-the-Water, the American loss being 12 killed and 55 wounded, and the British and Indian loss, though not definitely known, probably being considerably larger. On the 20th Colonel Lewis was joined by General Winchester with about 250 men, and on the 22d the combined force was defeated by a force of about 500 British, under Colonel Proctor, and about 600 Indians, under Round-Head and Walk-in-the-Water. In accordance with the orders of General Winchester, who had been captured by the Indians, Major Madison surrendered his troops as prisoners of war, on condition that protection be afforded by Proctor against the Indians. The prisoners who were able to march were taken by Proctor to Malden, Canada, and the wounded were left in the charge of an insufficient guard commanded by Major Reynolds at Frenchtown. On the 23d the wounded were massacred by the Indians, in what is known as the 'Massacre of the River Raisin.' Of the total American force 397 were killed or were missing, 537 were captured,

and only 33 escaped. The British lost about 24 killed and 158 wounded; while the Indian loss, though doubtless very large, was never accurately determined. Throughout the rest of the war 'Remember the River Raisin' was used as a battle-cry by the frontiersmen. Consult Dawson, *Battles of the United States* (New York, 1858).

FRENCH VERSION. See BIBLE.

FRENCH WEST AFRICA. A governor-generalship of France, comprising, in accordance with the decree of October 17, 1899, practically all of the Sahara; Senegal, including the western part of what had been known as French Sudan, which part was annexed to Senegal in 1899; the three military territories of French Sudan; and French Guinea, the Ivory Coast, and South Dahomey (Map: Africa, D 3). The Governor-General of French West Africa resides at Saint-Louis, Senegal, and besides exercising general authority over all the above-mentioned French possessions, acts as Governor of Senegal.

FREND, WILLIAM (1757-1841). An English reformer. He was born at Canterbury; was educated at Saint-Omer, France, and, after a few weeks spent in business in Quebec, went to Christ's College, Cambridge, where he studied for orders and took high honors. In 1781 he was chosen fellow. Two years afterwards he was appointed rector at Madingley, near Cambridge. In 1787 he became a Unitarian; tried to convert the surrounding country by an *Address to the Inhabitants of Cambridge . . . to turn from the false Worship of Three Persons to the Worship of the One True God* (1788), and did his best to do away with obligatory subscription to the Thirty-Nine Articles as a preliminary to the master's degree. For this heresy he was removed from his office of tutor. Five years later, after travels abroad, he wrote a radical pamphlet, *Peace and Union Recommended to the Associated Bodies of Republicans and Anti-Republicans*. The vice-chancellor and heads of the colleges tried him and found him guilty of breaking the statute *De Concionibus*. He was banished from the university, but continued to hold his fellowship until he was married (1808). In 1806 he went to London and was long connected with the Rock Life Assurance Company. He wrote *Principles of Algebra* (1796-99). His pamphlets, besides those mentioned above, were: *Thoughts on Religious Tests* (1789); *An Account of the Proceedings in the University of Cambridge Against William Frend* (1793); *Scarcity of Bread* (1795); *A Letter to the Vice-Chancellor of Cambridge* (1798); *Principles of Taxation* (1799); *The Effect of Paper Money on the Price of Provisions* (1801); *A Letter on the Slave Trade* (1817).

FRENEAU, fre-nô', PHILIP (1752-1832). An American poet, a graduate of Princeton (1771), where he was a college mate of James Madison and H. H. Brackenridge (q.v.). He wrote with the latter for the college commencement a poem on "The Rising Glory of America." He had begun writing verses early, and did much ephemeral work immediately after graduating. After teaching school for a time he studied law and made his first essay in journalism in Philadelphia. In 1776 he made a voyage to the Danish West-Indies, serving as mate and acquiring nautical experience. On his return to the United States he did some editing with Brackenridge, then took out

letters of marque and made a voyage in a privateer which he had built (1780). He was captured by the English, and recorded his experiences on a prison ship at New York in a prose narrative and in a strong poem in four cantos, "The British Prison Ship." He regained his liberty in July, 1780, wrote much in prose and satiric verse in periodicals, collected his poems (1786), and occupied himself as shipmaster and journalist till 1791, when Jefferson made him translator for the State Department, and induced him to take charge of the violently anti-Federalist *National Gazette*. Two years later Freneau retired to his home at Mount Pleasant, N. J., and edited the *Jersey Chronicle* for a year. Then he tried journalism in New York, but soon abandoned it for the sea. He made several voyages, one as far as Calcutta, but retired in 1809 in consequence of the laws restricting navigation. After this his life was uneventful. When nearly eighty-one he was found dead in a marsh, having lost his way in the snow while returning home from an entertainment. Editions of Freneau's poems (which are hard to obtain) were published during his life in 1786, 1788 (containing some prose), 1795, 1809, and 1815. The last was filled with panegyrics on the soldiers and sailors of the War of 1812. The edition of 1786 was reprinted in London and New York, 1861 and 1865. Freneau was the first genuine American poet of marked ability. Though his poetry is largely satirical, the most permanent is found in the beautiful lyrics, such as "The Indian Burying-Ground," "The Wild Honeysuckle," and "Eutaw Springs." His verses show a distinct love of nature, and prove him to have been a man of considerable culture, although in the main they follow conventional eighteenth-century models. He published a few volumes of prose under the pen-name of "Robert Slender," which have received and deserve little attention. Consult: The biography by Mary Austin (New York, 1901); Tyler, *Literary History of the American Revolution* (New York, 1897); and Wendell, *Literary History of America* (New York, 1900). A complete edition of Freneau's poems is being prepared by F. L. Pattee (1902).

FRENTANI. A people in Central Italy in the early ages, descended from the Samnites, but allies of Rome. They dwelt in a hilly region on the shores of the Adriatic Sea, and their chief town was Histonium.

FRENZEL, frén's'el. KARL WILHELM (1827—). A German journalist and novelist, born and educated in Berlin. In 1861 he became associated with the *National-Zeitung* of Berlin in the capacity of dramatic and literary critic. His works include many historical novels depicting French life during the eighteenth century. Several of these are well known, such as *Charlotte Corday* (1864); *Watteau* (1864); *La Pucelle* (1871); and *Lucifer, ein Roman aus der Napoleonischen Zeit* (1873). His *Berliner Dramaturgie* (reprinted 1882) is a valuable and interesting contribution to the history of the modern drama at the German capital.

FREPPÉ, fré-pèl'. CHARLES EMILE (1827-91). A French prelate and ecclesiastical historian. He was born at Obernai, Lower Alsace, and studied at the Theological Seminary, Strassburg, and was ordained in 1849. In 1854 he was appointed professor of church oratory at the University of Paris, in 1862 he became preacher

at the Tuileries, and in 1870 he was appointed Bishop of Angers. He was a champion of the doctrine of the infallibility of the Pope, which doctrine he defended before the Ecumenical Council at the Vatican. After the Franco-German War he publicly counseled the restoration of the monarchy, and on numerous occasions, more particularly during the controversy between Bismarck and the Vatican, he revealed his anti-German tendencies. The Catholic University at Angers was founded by him in 1875. Several of his numerous works on Church history and kindred subjects have become extremely popular. These include: *Les pires apostoliques et leur époque* (3d ed. 1870); *Les apologistes chrétiens au IIe siècle* (3d ed. 1886); *Examen critique de la vie de Jésus-Christ par M. Renan* (15th ed. 1866), a violent polemic directed against the well-known work by Renan. His complete works were published in 10 volumes (1880-88).

FRÈRE, frar. A family of French painters. **CHARLES THÉODORE** (1815-88), the elder, genre and landscape painter, was born in Paris. He was a pupil of Cogniet and Roquelin, and made his first exhibit in 1834. Two years later he went to Algeria, traversed the desert, visited the East, and was present at the fall of Constantine, in October, 1837. In 1869 he accompanied the Empress Eugénie in her voyage up the Nile, making a sketch-book of aquarelles at her request. His favorite subjects for pictures were scenes from Eastern life, but he occasionally produced military pieces. Small in size, his paintings are rich in color, accurate in design, and harmonious in execution. Among the best of them are a series of scenes in Constantine (1840-48), a "Bazaar in Damascus," a "Harem in Cairo," "Festival in Constantinople," "Ruins of Karnak," "Caravan of Mecca." He twice received the medal—in 1848 and in 1865. He died in Paris, March 25, 1888.—**PIERRE EDOUARD** (1819-86). A genre painter, brother of the preceding. He was born in Paris, January 10, 1819, and studied under Paul Delaroche and in the Ecole des Beaux-Arts. He exhibited his first picture in the Salon of 1843, and received two third-class medals—in 1850 and 1855—and a second-class medal in 1852. At the close of the Exposition of 1855 he was decorated with the cross of the Legion of Honor. He was one of the most sane and wholesome of French genre painters, and his portrayal of humble household scenes and child life are marked by true sentiment. He possessed also a fine sense of color. His pictures are well known through reproductions. Among the best are the "Little Gourmand," "Curiosity," "Repose," "The Little Cook," "First Steps," "The Library," "Going to School." Frère died at Anvers-sur-Oise, June, 1886.—**CHARLES EDOUARD** (1837—). A genre, landscape, and portrait painter, son and pupil of Théodore. He received a second-class medal in 1848, and a first-class medal in 1865. Among his paintings are the "Muleteer in the Alps" (1865), "The Basket-Sellers," "Before the Rain" (1875), "The Surgical Operation" (1884).

FRÈRE, frêr, Sir HENRY BARTLE EDWARD, familiarly known as Sir BARTLE FRÈRE (1815-84). A British diplomat and administrator. He was born at Clydach, Brecknockshire, March 29, 1815, and after education at Bath Grammar School went to Haileybury College to prepare for the Indian Civil Service, which he entered in 1834, and in

1835 received an appointment at Poona. His judicious treatment of native agriculturists led to beneficial results and to his advancement. In 1842 he became secretary to Sir George Arthur, Governor of Bombay; in 1856 proceeded to Sindh as British resident; and in 1860 was appointed chief commissioner. In 1859 he was created K.C.B. in recognition of valuable services during the Indian mutiny, for which he twice received the thanks of Parliament. From 1862-67 he was Governor of Bombay. On his return to England he was knighted and nominated member of the Indian Council in London. In 1872 he went as special commissioner to East Africa, and induced the Sultan of Zanzibar to sign a treaty abolishing the slave trade. In 1875 he was chosen to accompany the Prince of Wales to Egypt and India. He was Governor of Cape Colony 1877-80, and as High Commissioner for British South Africa was deputed to arrange the confederation of the South African colonies, which was frustrated by the Kaffir and Zulu wars and trouble with the Boers. He was recalled and lived in retirement at Wimbledon until his death, March 29, 1884. He was several times president of the Royal Asiatic Society, and in 1872 was elected president of the Royal Geographical Society. His writings, consisting of letters, speeches, etc., include a *Memoir of the Right Hon. John Hookham Frere*, prefixed to the latter's works (1871-74); *Pandurang Hari, or Memoir of a Hindoo*; and *Eastern Africa as a Field for Christian Labor* (1874). Consult Martineau, *Life and Correspondence of Sir Bartle Frere* (London, 1895).

FRÈRE, JOHN HOOKHAM (1769-1846). An English diplomat and author. He was born in London, and in 1785 went from a Putney preparatory school to Eton. He proceeded to Caius College, Cambridge; graduated B.A., 1792; M.A. in 1795, and was elected a fellow. He entered the Foreign Office under Lord Grenville and from 1796-1802 represented Looe, Cornwall, in Parliament. As a contributor to the *Anti-Jacobin* he supported Canning's defense of Pitt's Administration, and in 1799 was made Under-Secretary of State. He was appointed Envoy to Lisbon in 1800, and twice went as Minister to Spain in 1802 and 1808. His counsel, resulting in Sir John Moore's disastrous retreat to Corunna, caused his recall. He afterwards refused an ambassadorship at Saint Petersburg, and twice declined a peerage. Owing to his wife's ill health, he retired to Malta, and devoted himself to literature and languages. His mock-heroic poem, *Prospectus and Specimen of an intended National Work by William and Robert Whistlecraft, of Stow-Market in Suffolk, Harness and Collar makers, intended to comprise the most interesting particulars relating to King Arthur and His Round Table* (1817), furnished the model for Byron's *Beppo* and *Don Juan*. Frere's fame rests on his admirable translations of Aristophanes, *The Acharnians*, *The Knights*, *The Birds*, and *The Frogs*, which were privately printed, and only made public in 1847 by Sir G. Cornwall Lewis in *The Classical Museum*. Consult *Memoir and Works of the Right Hon. John Hookham Frere*, by his nephews, W. E. and Sir Bartle Frere (London, 1874).

FRÈRE-ORBAN, frar' or'bän', HUBERT JOSEPH WALTHER (1812-96). A Belgian statesman. He was born at Liège, received his education at home and in Paris, and began the practice

of law in his native town. He identified himself with the Liberal Party, and was conspicuous in the controversy with the Catholic clergy. In 1847 he was elected to the Belgian Chamber, and appointed Minister of Public Works, and from 1848 till 1852 he held the portfolio of finance. His work, *La main morte et la charité*, directed against the Conservatives, produced a great effect on the position of parties in Belgium. In 1857 the Liberals returned to power and Frère-Orban became once more Minister of Finance in the Cabinet of Rogier. In 1870 the Catholics regained their supremacy and forced him to retire, but from 1878 to 1884 he was again at the head of the Cabinet. Subsequently he led the opposition in Parliament till 1894, when he lost his seat. He was a successful financier and a believer in the doctrine of free trade. His liberalism consisted in the assertion of the authority of the State over the Church and the defense of the system of secular public instruction against the clergy. He was at all times opposed to the undue extension of the suffrage.

FRERICH'S, frä'riks, FRIEDRICH THEODOR VON (1819-85). A German physician, born at Aurich, and educated at Göttingen and Berlin. After holding a professorship at Kiel and conducting the clinical institute and hospital in that city, he was for eight years professor of pathology and therapy at Breslau (1851-59), whence he was called to Berlin in 1859, where he became permanently established. He was considered one of the leading medical authorities in the German capital, and as physician on the general medical staff of the Prussian Army, rendered particularly valuable services during the Franco-German War. His principal work is the *Klinik der Leberkrankheiten* (2d ed. 1861; English translation, 1860, under the title *A Clinical Treatise on the Diseases of the Liver*; also translated into French and Italian).

FRÉRON, frä'rön', ELIE CATHERINE (1719-76). A French critic and controversialist, noted as the chief opponent of Voltaire. He was born at Quimper. A brilliant pupil of the Jesuits, he was made professor at the Collège Louis-le-Grand at the age of twenty, and on leaving the Jesuits (1739) was engaged for thirty-five years as contributor to literary journals, in which he carried on a relentless war with Voltaire in particular and against the encyclopædic movement in general. His work is not without cleverness and good literary judgment, but is best remembered for the retorts it evoked from Voltaire, notably *Le pauvre diable*, *L'Ecossoise*, and *L'âne littéraire* (The Literary Donkey), the title of which parodied that of Fréron's journal *L'Année Littéraire* (1754-76). Fréron wrote also histories of *Mary Stuart* (1742), and of *Germany* (1771), as well as negligible verses. He died in Paris, March 10, 1776. Consult: Nisard, *Les ennemis de Voltaire* (Paris, 1853), and Monselet, *Fréron* (Paris, 1864).

FRÉRON, LOUIS STANISLAS (1765-1802). A French journalist and legislator, son of the preceding, born in Paris. He was educated at the Collège Louis-le-Grand, and first came prominently before the public as editor of the *Année Littéraire*. In 1790 he founded the revolutionary journal *L'Orateur du Peuple*. He was elected a deputy to the convention in 1792, was follower of Danton, and after perse-

cutting the Royalists with great cruelty, contributed to the downfall of Robespierre and attacked the Terrorists, finally entering into negotiations with the Monarchist faction. He was appointed subprefect of Haiti by Napoleon in 1802, where he died soon afterwards from the effects of the climate. His *Mémoire historique sur la réaction royale et sur les massacres du Midi* (1796) contains a defense of his conduct at Toulon in 1793, as commissioner of the Army of Italy.

FRESCO (It., cool, fresh), or **FRESCO-PAINTING**. The term properly applied to painting executed upon plaster while it is still wet or fresh: hence the Italian name *al fresco*. It is also improperly used for all painting executed directly on the surface of a wall by whatever process, even in encaustic (q.v.), the process of burning in with the use of wax, or in *tempera* (q.v.), also called *distemper*, which is the process where water-colors mixed with egg or some glutinous substance are used. The method of true fresco-painting is as follows: A wall, either of brick or stone (better than laths) and perfectly dry, is plastered with lime and water (hydrate of lime), which has been prepared and allowed to stand for at least a year. Before using it is mixed with sand and while the water is in process of being expelled by the carbonic acid in the lime, the pigments must be applied in order that the protective covering of carbonate of lime may form over them. The first and coarser coats, called *arriccio*, may be applied over the entire wall about half an inch thick and with a roughened surface; the two finer finishing coats, called *intonaco*, are applied only on whatever portion of the surface can be painted in a day. This surface is then covered by the corresponding portion of the artist's cartoon, of the same size as the finished fresco is to be. This cartoon is executed usually in black and white and quite sketchily, though the artist often has for further assistance a smaller sized colored sketch for use in the details and color scheme. The impression of the cartoon is left on the plaster either by pouncing or by indenting the outlines with a pointed implement of wood or bone, and the cartoon being then removed, the painter proceeds to apply the colors; these are mostly earths or minerals, as few others will stand the action of lime, and they are ground and applied with pure water. The coloring is necessarily thin, transparent and light, though since the late Renaissance the more liberal use of *impasto* has lessened these qualities, giving greater opacity. When the day's work is finished the artist cuts away any of the plaster that he has not painted on, beveling it at the very edge of his finished work, and the next day the plasterer joins closely another portion of plaster to the edge of the portion painted on the previous day. The lime, in drying, throws out a kind of crystal surface, which protects the color, and imparts a degree of clearness much superior to, and easily distinguishable from, that of a work in *tempera* or size paint. This process, although apparently simple, nevertheless requires great dexterity and certainty of hand; for the surface of the plaster is delicate, and must not be overworked; besides, the lime only imbibes a certain quantity of additional moisture in the form of liquid colors, after which it loses its crystallizing quality, and the surface, or a portion of it, becomes what painters call rotten.

Many frescoes are defective in this way. It is only after the lime has dried that such flaws are discovered; the proper plan in such a case is to cut away the defective portion, have fresh plaster laid on, and do the work over again. But the flaws are too often retouched with *tempera* or size colors; and though they may escape notice for a time, the parts touched will change or come off in the course of a few years. All retouching must, of course, be done *a secco* on the dry plaster and must be sparingly used. Another difficulty in fresco is that the colors become much lighter after the plaster dries, and for this allowance must be made. However, by practice, the painter may soon get over this difficulty; and he can test the difference between the color as wet and as dry, by putting a touch on a piece of umber he has generally at hand, which instantly dries the color, and shows it as it will be when the lime has dried. *Fresco secco* is a spurious kind of fresco, ordinarily used only in house decorations. The colors are the same, but they are laid on after the plaster is dry. Before the work begins the dry plaster is rubbed with pumice-stone to remove the crust, and then washed with water mixed with a little lime. The effect is coarse, dry, and common, and the thin protecting crust is inadequate to preserve the painting.

The preëminence claimed for fresco-painting is founded on: (1) Clearness and purity of color; (2) a dead surface as far removed from the dullness of *tempera* as from the gloss of oils and so capable of being viewed from all points; (3) durability under all conditions; (4) cheapness of process; (5) necessity for quick work, precluding the frittering of artistic energy on unessentials. On the other hand, it labors under the disadvantage of the fragility of the plaster, the liability to whitewash, the lack of depth and richness, and the necessity of more or less retouching by another process (*a secco*).

FRESCOBALDI, frès'kô-bâl'dè, GIROLAMO (1583-1644). A celebrated Italian organist and composer, born at Ferrara. Very little of his earlier life and training is known, although he had published a collection of five-part madrigals as early as 1608. He appears to have studied with Luzzaschi in his native place, afterwards taking up his residence in Belgium. Returning to Italy he lived first in Milan, and in 1627 in Rome, where three years later he obtained the position of organist at Saint Peter's. By this time he had acquired wide fame as an organ virtuoso, as many as 30,000 people, it is recorded, having gone to hear his first performance at Saint Peter's. With the exception of one short interval (1628-33), during which period he held the appointment of Court organist at Florence, he retained his position at Rome. He is regarded by many historians and musical authorities as the greatest organist of the first half of the seventeenth century, while as a composer he is scarcely less famous. In the latter capacity he is credited with anticipating the modern key system, and the introduction of advanced ideas in fugal form and musical notation. Frescobaldi's music is the highest type of early seventeenth-century music, and displays the consummate art of the Early Italian School. His vocal compositions include canzones, motets, hymns, and the collection of madrigals already noted. He died in Rome.

FRESenius, frē-zā'nē-us, KARL REMIGIUS (1818-97). An eminent German analytical chemist. He studied at Bonn and at Giessen, and was assistant to Liebig. In 1845 he became professor of chemistry and allied sciences at the Agricultural Institute of Wiesbaden. Fresenius carried out numerous important investigations in analytical chemistry, and did much toward systematizing this art by the publication of excellent works. His exhaustive standard treatises, well known to every student of chemistry, have passed through many editions in German, and have been translated into several languages. They include: *Anleitung zur qualitativen chemischen Analyse*, first published in 1841, and *Anleitung zur quantitativen chemischen Analyse* (1845). In 1862 he founded the *Zeitschrift für analytische Chemie*. See ANALYSIS, CHEMICAL.

FRESH-AIR WORK. A form of charity which consists in taking poor children from the slums of great cities into the country or to the seashore for recreation. The first authenticated case of charity of this kind was in 1849, when Rev. William A. Muhlenburg, a pastor in New York City, sent poor and sick people from his parish into the country for short vacations. In 1872 the *New York Times* inaugurated a system of free excursions, and its example was followed in other parts of the country. The first general fresh-air societies were organized in 1874. Since that time, by reason of the earnest support of philanthropists and of such newspapers as the *New York Evening Post* and *Tribune*, the number of such societies has greatly increased. The general agencies in thirty-eight cities furnish as many as a million days' outing to the poor and destitute, while sectarian and private organizations add greatly to this number. In New York City alone, fourteen general and non-sectarian organizations, and no fewer than nineteen denominational and special societies, are in the field. The beneficiaries are, for the most part, children from six to twelve years old, though some of them are infants. A few adult women usually accompany them. They are sent away from the city for periods varying from a few hours to a fortnight spent in the so-called country 'homes,' or as the guests or boarders of private families. As a rule, the parents of the children are not required to bear any of the cost. In London, on the other hand, parents often pay as much as a third or more of the expenses. Some confusion, however, results from this practice. Different fresh-air societies compete with each other, diminishing the contribution which the parent is required to make, thus making impossible the benefits which would result from coöperation.

On the Continent of Europe, Switzerland was the first country to develop this form of charity. The Rev. W. Bion, of Zurich, established the first of the Vacation Colonies in 1876. Provision had been made for poor children previously, but it was not until that year that the work was systematized and brought into close relation with the public schools. In 1895 Switzerland had seventy-three of these colonies, to which 2,119 children were sent in that year. The colonies are usually situated in the mountains. Comfortable lodgings and wholesome food are furnished free of charge. Part of the expense is borne by the State and by municipal governments. The organization of fresh-air charity in Germany was contempora-

neous with its organization in Switzerland. The first children's sanatoriums were organized in Kolberg and Rothenfelde in 1874. Two years later the first children were sent to vacation colonies, and during the twenty years following 300,000 children were cared for at an expense of 15,000,000 marks. In addition, large numbers of children are given excursions lasting a day. Those who are sent to a distance, to seaside or health resorts, are usually accompanied by a teacher. One hundred and twenty-five cities had established colonies before 1896, and were sending 30,000 children to them yearly. It is also common in Germany and Denmark for the artisan classes in the city and country to make a temporary exchange of children during a part of the summer. In France, fresh-air charities are less developed than in any other important European country, but they are gradually rising in importance. Paris sent 4254 children to the country and seashore in 1897. Lyons, Bordeaux, Lille, Toulouse, Nancy, Besançon, and other cities have established colonies. The system of placing children in private families to board is preferred to that of sending them to 'homes' or sanatoriums in the country, but the German plan of exchanging city and country children is found unsatisfactory. The vacations are long. The child is often left in the country for a little more than a month, at a cost of about 20 francs.

Vacation colonies have also been established in Spain, Italy, Austria-Hungary, Belgium, Russia, and in Argentina. The system in Europe is superior to the system in the United States in two respects—there is marked coöperation of fresh-air agencies in Europe by means of conferences and exchange of reports; and the work is closely affiliated with the public schools. Consult: U'ford, *Fresh Air Charity in the United States* (New York, 1897); Germain, "Vacation Colonies in Switzerland," *Consular Reports*, vol. lii., No. 193; Comte, "Les colonies de vacances," *Revue philanthropique* (Paris, 1898).

FRESH-WATER MARSH-HEN. See RAIL.

FRESH-WATER MUSSEL. Any of the great many species of Unio or Anodon—bivalve or pelecypod mollusks of rivers and ponds, especially abundant in North America. See MUSSEL.

FRESNEL, frā'nēl', AUGUSTIN JEAN (1788-1827). A French physicist. He was born at Broglie, and was educated at Caen at the Ecole Polytechnique, and at the Ecole des Ponts et Chaussées. On the completion of his studies he was sent as Government engineer to the Department of Vendée, and afterwards to the Department of Drôme, where he remained till 1814. He lost his position on the return of Napoleon from Elba, because he, as a Royalist, had offered his services to the Bourbons. After the Second Restoration he returned to Paris, where he resumed his duties as Government engineer. In the interval he devoted his enforced leisure with great success to physico-mathematical researches, investigating in particular the polarization of light. In ignorance of the work of Young, Fresnel demonstrated to his countrymen the error of the Newtonian theory of the propagation of light (q.v.) by the emission of material particles, and so ably advocated the undulatory hypothesis that Arago, who was a member of a commission appointed to consider the paper containing the new theory, became.

an enthusiastic convert to his ideas. Fresnel's crowning experiment, which demonstrated the truth of the theory, was with the two mirrors inclined at an angle of nearly 180°, so that the incident beams were reflected to the same point, and alternate light and dark bands or fringes were seen. This was not caused by diffraction, as the beams were reflected from the surface of the mirrors. With Arago he investigated the action of polarized light, and their discoveries, published in a joint memoir, confirmed the new theory of the mode of the propagation of light. His practical application of scientific optics to the improvement of the lighthouse system was of incalculable value, and he served for several years as a member of the lighthouse commission. See LIGHTHOUSE.

FRESNILLO, frēs-n'lyō. A town in the State of Zacatecas, Mexico, 36 miles by rail northwest of the city of Zacatecas; on the Mexican Central Railway (Map: Mexico, H 6). It is situated at an elevation of nearly 6900 feet, and is well built and laid out with broad, straight streets. Stock-raising is carried on in this region, but the town derives its chief importance from the rich silver and copper mines of the Cerro del Proaño, discovered in 1554. There are other mineral deposits. Population, in 1895, 6757.

FRESNO. A city and the county-seat of Fresno County, Cal., 207 miles southeast of San Francisco; on the Southern Pacific and the Atchison, Topeka and Santa Fé railroads (Map: California, D 3). It has a public library building (\$30,000), the gift of Andrew Carnegie, and \$100,000 has been appropriated by Congress for a United States Government building. The city is the centre of an agricultural and stock-raising district, has important petroleum interests, and extensively exports raisins, the annual production of which is valued at \$3,000,000, wines and brandies, grapes, oranges, olives, and other fruits, besides wheat, sheep, and horses. Under a charter of 1901 the government is vested in a mayor, elected every four years, a municipal council, and administrative officials, all of whom are appointed by the mayor with the consent of the council, excepting the city clerk, police judge, and school directors, chosen by popular vote. Settled in 1872, Fresno became the county-seat in 1874, and was chartered as a city in 1885. Population, in 1890, 10,818; in 1900, 12,470.

FRESTON. An enchanter in the Spanish romance *Belianis of Greece*. Don Quixote accuses him of stealing his library and changing the giants into windmills.

FRET (probably from OF. *frete*, iron band, ferrule, syncopated from It., ML. *ferrata*, iron grating, from *ferrare*, to bind with iron, from Lat. *ferrum*, iron). A charge in heraldry (q.v.).

FRÉTEAU DE SAINT JUST, frā'tō' de sän zhüst'. EMMANUEL MARIE MICHEL PHILIPPE (1745-94). A French politician and magistrate. In 1787 he was imprisoned in the Castle of Doullens for his opposition to the King, but returned to his seat in Parliament a year later. He was elected a Deputy to the States General, and was one of the first of his rank to join the Third Estate. He became a member of the Constitutional Committee, then secretary and twice president of the Assembly. In 1790 he introduced a resolution that only the Assembly, acting on the

King's initiative, had the right to make war; demanded that the title of Archbishop should be done away with, and also voted for the suppression of all titles of nobility; and near the end of the year was elected judge in Paris. In 1792 he resigned from the presidency of the First Arrondissement, and retired to his home at Vaux-le-Pénil. Two years afterwards he was arrested on the charge of joining two priests in an attempt to incite insurrection. He was acquitted, but was kept in prison, and two months later was tried and executed for favoring the schemes of Capet, and for complicity with Thouret and Le Chapelier.

FRETS. Pieces of wood or metal placed transversely on the finger-boards of some of those stringed instruments that are plucked by the finger, or played with a plectrum, to mark off the intervals. In the Middle Ages instruments played with the bow had frets, such as the rebec and the viola de gamba. Frets were used by the Chinese, East Indians, Egyptians, and probably were introduced into Europe by the Arabians. They are still used on the guitar, the banjo, the mandolin, and the zither.

FREUND, froint. HERMANN ERNST (1786-1840). A Danish sculptor, born at Uthlede, near Bremen. He was apprenticed to a blacksmith, but afterwards obtained some training at the Academy of Fine Arts at Copenhagen, and in 1817 gained the prize there, which enabled him to travel for three years. In Rome he became the friend of Thorwaldsen, and modeled statues of "Mercury" and "Saint Luke," while still under his influence. In 1827 he executed his masterpiece, the Ragnarök frieze, which was almost destroyed by a fire in the Palace of Christiansborg (1884). Among his other works are "Thor," "Odin," a "Child Riding on a Swan," and many monuments and busts. His life was written by his son Victor Freund and edited by Baumann (Copenhagen, 1883).

FREUND, WILHELM (1806-94). A German classical scholar, born of Jewish parents at Kempen, Posen. He was educated at Berlin, Breslau, and Halle, and taught at Breslau (1828-29), at Hirschberg (1848-51), and at Gleiwitz (1855-70). His great work is the *Wörterbuch der lateinischen Sprache* (1834-45). On the same principle are his *Gesamtwörterbuch der lateinischen Sprache* (1844-45) and the *Lateinisch-deutsches und deutsch-lateinisch-griechisches Schulwörterbuch* (1848-55). The Latin-English dictionaries by Andrews, Smith, Lewis, and Short, and Riddle and White are all based upon his work. Only a little less important than his lexicographical work was the valuable *Wie studirt man Philologie?* (5th ed. 1885). He also wrote: *Tafeln der Literaturgeschichte* (1877); *Triennium Philologicum* (3d ed. 1885); a long series of *Präparationen zu den griechischen und römischen Klassikern*, beginning in 1859; and *Wanderungen auf klassischem Boden* (1889-92).

FREY, fri, or **FREYR** (Icel., lord). The son of Njörd, of the dynasty of the Vanagods. He was adopted with his father among the Æsir, who, when he got his first tooth, bestowed upon him the celestial castle Alheim. He is the god of peace and fruitfulness; dispenses rain and fertility; and to him prayers for a good harvest are addressed. He wakens the earth from the sleep of

winter. His wife is Gerda, daughter of the giant Gymer. Frey had seen her as he once ascended the lofty seat of Odin, *Hlidskjalf*, from which everything on earth is seen. Gerda was so beautiful that the brightness of her arms illuminated air and sea. Seized with love, Frey sent Skirnir as spokesman, and for his services had to give him his sword, which he will miss in the final contest or eclipse of the gods. His magic ship *Skidbladnir*, which could be folded up like a cloth, represents the clouds that dissolve at the rays of the sun. Like Freyja, he was the patron of marriage, and probably the two were at one time conceived as united hermaphroditically. Frey was held in great veneration, especially in Sweden, of which he was patron god, in Norway, and from there also in Iceland. His chief temple was at Upsala, where a bloody offering was yearly made to him of men and animals. His festival was at the winter solstice, and while the god was borne round the land all strife was laid aside. Oaths were often sworn in his name, and he was called on to avenge wrongs. He is even called the god of the world and the prince of gods. It is probable that the goddess Nerthus, described by Tacitus in the *Germania* as *terra mater*, was the wife of Niord, and the mother of Frey. Consult Paul, *Grundriss der germanischen Philologie*, i. (Strassburg, 1896, et seq.).

FREY, fri, EMIL (1838—). A Swiss statesman. He was born at Arlesheim, and after studying at Jena, came to the United States, where, during the Civil War, he fought with distinction in the Union Army, and was advanced to the rank of major. In 1865 he returned to Switzerland, where he became distinguished as a statesman and journalist. He was editor of the *Basler Nachrichten* from 1872 to 1882, in which year he was appointed Minister Plenipotentiary to the United States. Returning in 1888, he was in 1893 elected President of the Swiss Confederation. He became an active promoter of educational reform, and an advocate of international legislation for the regulation of factory service. Scarcely less distinguished have been his services in behalf of the construction of the Saint Gotthard tunnel, and of other avenues of intercourse, the modification of the forestry laws, the extension of the fortification system, and the improvement of the Army. In 1897 he was made Director of the International Telegraph Bureau at Bern.

FREY, FRIEDRICH HERMAN N. See GREIF, MARTIN.

FREY, HEINRICH (1822-90). A German anatomist and zoölogist. He was born at Frankfurt-on-the-Main, and studied medicine at Bonn, Berlin, and Göttingen. In 1848 he was appointed professor of comparative anatomy and histology at Zurich, and professor of zoölogy at the Polytechnic Institute in that city. Most of his works are devoted to histology and microscopy, and are considered among the best productions on those departments of science. Especially important are the following: *Histologie und Histochemie des Menschen* (5th ed. 1876; Eng. transl. by A. E. J. Barker, 1874); *Das Mikroskop und die mikroskopische Technik* (8th ed. 1886; Eng. transl. by G. R. Cutter, 1874); *Grundzüge der Histologie* (3d ed. 1885). He was especially skillful in researches in the subject of microlepidoptera, which topic he discusses in the works entitled *Die*

Tineen und Pterophoren der Schweiz (1856) and *Lepidopteren der Schweiz* (1880).

FREY, JAKOB (1824-73). A German-Swiss novelist, who wrote but little, but that of rare quality. He was born at Gutenschwyl, Canton of Aargau, studied at the universities of Tübingen, Munich, and Zurich, was editor of a paper at Aarau, and afterwards at Bern, and having for some years lived at Basel, settled in 1868 at Aarau, where he died. His collection of tales, *Zwischen Jura und Alpen* (1858), the novel *Die Waise von Holligen* (1863), and the three volumes of *Schweizerbilder* (1864 and 1877), are all works of distinction and artistic genius.

FREY, JOHANN JAKOB (1681-1752). A Swiss engraver, born at Lucerne. His success with several engravings after Guido and Albano gave him a high reputation, which he maintained by his other works. He is not always perfect in his line, but there is so much breadth and serenity about his plates as a whole that the fault is readily forgiven. He engraved a number of Carlo Maratta's pictures, a beautiful "Holy Family" after Raphael, "San Carlo Borromeo" after Pietro Cortona, and reproductions of many other Italian painters of the time.

FREY, JOSEPH SAMUEL CHRISTIAN FREDERICK (1773-1850). An American clergyman, born at Mainstockheim (Bavaria), Germany. As a Jew he was instructed in Hebrew theology, in 1794 became a leader in the Synagogue, in 1798 turned Protestant Christian, and in 1800-07 was a missionary of the London Missionary Society among Hebrews in the United Kingdom. In 1816 he came to the United States, in 1818 founded and was appointed pastor of the Mulberry Street Congregational Church, New York City, and in 1820 established the American Society for Meliorating the Condition of the Jews, whose object was to receive and make provision for Hebrew immigrants from all nations. He left the Congregational Church to join the Baptists in 1827, and after having occupied several pastorates in the Baptist denomination, resigned, and in 1837-40 labored with little success in Europe as a representative of the American Society for the Conversion of the Jews. In 1840 he returned to the United States, and later he settled at Pontiac, Mich., where he was instructor in Hebrew in the preparatory department of the University of Michigan. His publications include: *A Narrative of My Life* (1809); *Judah and Israel* (1837); and *Joseph and Benjamin: A Series of Letters on the Controversy Between Jews and Christians* (2 vols., 1842).

FREYBERG, fr̃b̃erk, KONRAD (1842—). A German painter of military subjects, born at Stettin. He studied in Berlin at the Academy, and under Steffek, making a specialty of horses and military groups, and in 1867 went to Paris, where he took the works of Horace Vernet for his model. In 1870 he accompanied the German army to France, in the suite of Prince Albrecht of Prussia, and settling afterwards in Berlin, depicted a number of episodes from that campaign, among which "Prince Charles of Prussia and Suite before Paris" (1872), "Surrender of Metz" (1877), and "Episode in Battle of Le Mans" (1879) are the more noteworthy. Of his equestrian portraits and groups, those on a smaller scale are the most successful.

FREYCINET, frâ'sé'nâ', CHARLES LOUIS DE SAULCES DE (1828—). A French statesman. He was born at Foix, in the Department of Ariège, and was educated at the Ecole Polytechnique in Paris. In 1856 he was appointed *chef d'exploitation* of the Railway Company of the South. From 1856-61 Freycinet undertook several journeys in the employ of the Government, and published as a result of his observations an admirable work on city sanitation. After the fall of the Empire, Gambetta appointed Freycinet Prefect of the Department of Tarn-et-Garonne, and in October, 1870, he was associated with Gambetta as 'personal delegate of the Minister of War.' In this capacity Freycinet displayed remarkable energy and ability, particularly in the rapid organization of the military railway and telegraph service, and the furnishing of the staff with strategic maps. He retired after the armistice, and published *La guerre en province pendant le siège de Paris* (1872). He was elected to the Senate in 1876; was appointed Minister of Public Works in 1877, and was intrusted with the formation of a Cabinet by President Grévy, in 1879, assuming the portfolio of Foreign Affairs. Not being in accord with Gambetta, he resigned the Premiership in 1880; but on the resignation of Gambetta in 1882, Freycinet formed a new Cabinet, which resigned a few months later, upon being refused a vote of credit for the protection of the Suez Canal. In 1885, on the downfall of the Ferry Cabinet, he was summoned by President Grévy to form a new Ministry; but not succeeding in harmonizing the conflicting elements, he entered the Cabinet formed under Henri Brisson. He formed a new Cabinet in January, 1886, but was forced to resign in December. He was Minister of War from 1888 to 1893, being also Premier from 1890 to 1892. He went out of office, together with the rest of the Cabinet, in January, 1893, as a result of the investigations into the Panama affair. From November, 1898, to May, 1899, Freycinet was once more Minister of War, in the Dupuy Cabinet. In 1887 he was elected a member of the Academy of Sciences, and in 1890 a member of the French Academy. He has written a number of works on engineering and mathematics, among others: *Traité de mécanique rationnelle* (1858), and *De l'analyse infinitésimale* (1860); also *Essais sur la philosophie des sciences* (1895).

FREYCINET, LOUIS CLAUDE DESAULCES DE, (1779-1842). A French naval officer and navigator. He was born at Montélimart in the Department of Drôme, August 7, 1779. In 1795 he took part in several engagements against the English and Spanish, and in 1800 he joined, with his brother Louis Henri, who afterwards rose to the rank of admiral, the expedition sent out under Captain Baudin in the *Naturaliste* and *Géographe* to explore the south and southwest coasts of Australia. Much of the ground already explored by Flinders was revisited. In 1805 Freycinet returned to Paris and was given an appointment in the Department of Marine Maps and Charts. In 1817 he commanded the *Uranie*, in which Arago and others went to Rio de Janeiro to take a series of pendulum measurements. This was part of a larger scheme for obtaining observations, not only in geography and ethnology, but in astronomy, terrestrial magnetism, and meteorology, and for the collection of specimens

in natural history. For three years Freycinet cruised about, visiting Australia, the Marianne, Hawaiian, and other Pacific islands, and South America, returning to France, notwithstanding the loss of the *Uranie*, with fine collections in all departments of natural history. He published several scientific memoirs, and two accounts of his travels: *Voyages de découverte aux terres australes pendant les années 1800-04* (2d ed. 1824-25), and *Voyage autour du monde entrepris par ordre du roi*, in 13 volumes (1824-44). He was one of the founders of the Geographical Society of France.

FREYJA, fri'yä, and **FRIGGA** (Icel., lady, fem. of *Frey*). Two goddesses, spoken of in northern mythology as distinct, but originally one, and intimately associated with Frey. Frigga, in the genealogy of the Æsir (q.v.), is the supreme goddess, wife of Odin, and one of the daughters of the giant Fiörgyn, and presides over marriages. Freyja is the daughter of Njörd, sister of Frey, and goddess of love. She is drawn on a car yoked with cats; to her, deceased women go, and also the half of all men that fall in battle, whence she is called Val-Freyja. In this last respect she must be considered as signifying the earth; but the earth is also represented by Frigga, the wife of Odin, and when Freyja seeks Odin, Odin symbolizes the sun. The names Frigga and Freyja are in signification almost alike, and the two are often confounded in mythology. The Anglo-Saxons and Lombards worshiped the wife of Odin as Frea. The name yet survives, probably, in *Friday*.

FREYLINGHAUSEN, fri'ling-hou'zen, JOHANN ANASTASIUS (1670-1739). A German religious poet, born at Gandersheim. He studied theology at Jena, and in 1692 became permanently established at Halle, where he was chief pastor and director of the Pedagogical Institute. His *Compendium der christlichen Lehre* was translated into English by J. Planta in 1804 under the title, *An Abstract of the Whole Doctrine of the Christian Religion*. His *Grundlegung der Theologie* (14th ed. 1744) was also very popular in its day. It is chiefly, however, as a writer of hymns that Freylinghausen is known, among his principal publications of this kind being the *Geistreiches Gesangbuch* (1714), containing 683 songs, and *Neues geistreiches Gesangbuch*, containing 798 songs. These songs obtained a wide popularity in the Protestant Church service, and have been frequently republished. Freylinghausen is said also to have been an excellent musician.

FREYTAG, fri'täg, GEORG WILHELM FRIEDRICH (1788-1861). A distinguished German Orientalist, born at Lüneburg. He studied theology and Oriental philology at Göttingen, and from 1811 to 1813 acted as tutor there. In 1813 he became public librarian at Königsberg, and in 1815 chaplain in the Prussian Army, in which capacity he visited Paris, and remained there after peace was proclaimed in order to continue the study of Persian, Turkish, and Arabic under the famous De Sacy. In 1819 he was appointed to the professorship of Oriental languages in the recently established University of Bonn, and this post he held until his death. He edited and translated into Latin two volumes of Arabic songs, *Hamasa Carmina* (1828-52), and edited three volumes of Arabic proverbs, *Arabum Pro-*

verbia (1838-43). He also published a Hebrew grammar, and a treatise on Arabic versification. His greatest work, however, was his *Lexicon Arabico-Latinum* (4 vols., 1830-37; abridged edition, 1837).

FREYTAG, GUSTAV (1816-95). A German novelist and dramatic writer of distinction. He was born at Kreuzburg, Silesia, July 13, 1816, studied at Breslau and Berlin, taught as privat-docent at the University of Breslau, and after a brief residence in Dresden went to Leipzig, to become editor of *Die Grenzboten* (1848-70). During this period he had published, together with other dramas of minor interest, *Die Journalisten* (1853), one of the best modern German comedies, still often acted; the admirable novel *Soll und Haben* (1855, translated into nearly all European languages), dealing with the inevitable conflict between the spirit of caste and privilege, rooted in the feudal past of Germany, and the new industrial and democratic spirit of the age; another novel of merit, *Die verlorene Handschrift* (1864); a valuable contribution to the theory of dramatic criticism, *Die Technik des Dramas* (1863), translated into English by McEwen (Chicago, 1894); and the most popular historical essays of his generation, *Bilder aus der Deutschen Vergangenheit* (4 vols., 1859-62). From 1867 to 1870 Freytag represented Erfurt in the North-German Reichstag, and during the French War he was for a time attached to the staff of the Crown Prince. A journal of these days, *Der Kronprinz und die deutsche Kaiserkrone*, published in 1889, revealed, in a way unwelcome to the Court, the liberal tendencies of the deceased Frederick III. and supplemented the brief autobiographic *Erinnerungen aus meinem Leben* that had accompanied Freytag's collected *Works* (22 vols., 1887). His great work since 1870 was the series of historical novels *Die Ahnen* (1872-1880), a monument to the continuity of German character through all the ages of its history and already a classic in its literature. To this national task Freytag gave eight of his maturest years, and he brought to it the preparation of long historic investigations. The stories reach back in *Ingo und Ingraban* to the twilight of German history, and bring the reader to the Christian conversion; show in a second volume, *Das Nest der Zaunkönige*, the growing dominance of the Roman Church; in a third, *Die Brüder vom deutschen Hause*, the struggles of the Teutonic Knights; and in a fourth, *Markus König*, the Reformation and the founding of the Prussian State. The fifth, *Die Geschwister*, deals with the Thirty Years' War; and the last, *Aus einer kleinen Stadt*, with the revival of national life after the humiliations of the Napoleonic conquest. While these novels were appearing, Freytag wrote much for a weekly, *Im neuen Reich*; but in 1879, *Die Ahnen* finished, he withdrew from active life and lived chiefly at Wiesbaden, where he died, April 30, 1895. His complete works were published in 22 volumes (1886-88). For his biography, consult Alberti (Leipzig, 1885), and Seiler (ib., 1898).

FRIANT, fré'ân', Louis, Count (1758-1829). A French general, born at Villers-Morlancourt, Somme. After participating in the wars following upon the French Revolution, he accompanied Napoleon as brigadier-general to Egypt in 1798, and was appointed Governor of Upper Egypt by

Kléber. He fought with distinction at Heliopolis (March 20, 1800) and Cairo, and was appointed general of division; but after a futile defense of Alexandria was compelled to surrender to the allied armies of England and Turkey (August, 1801). In recognition of his merit, the title of count was conferred on him at the coronation of Napoleon. He subsequently participated in nearly all the great battles of the Napoleonic wars, from Austerlitz to Waterloo, his valor and skill being particularly conspicuous in the attack at Wagram.

FRI'AR (OF. *frere, freire*, Fr. *frère*, Sp. *fray, fraile*, It. *frate*, from Lat. *frater*, brother). A generic name applied to the members of certain comparatively modern religious communities in the Roman Catholic Church, in contradistinction to the older title of monk, which designated especially the Benedictines and their branches, and is only applied by incorrect popular usage to the mendicant Orders. The founders of the Dominican and Franciscan Orders, from motives of humility, chose the simple title of brother to designate their followers. Saint Francis called his *fratres minores* friars minor (lesser brothers), while Saint Dominic gave his Order the name of *fratres prædicatores* (preaching friars). The popular English names of these Orders, derived from the color or other distinguishing mark of their habit—such as gray friars (Franciscans), black friars (Dominicans), white friars (Carmelites), crutched friars (Canons Regular of the Holy Cross), and Austin friars (Augustinians)—are preserved to this day in the names of streets and localities in English towns. See MONASTICISM.

FRIAR BACON. A popular title for Roger Bacon. It is employed in a play by Robert Greene, entitled *The Honorable History of Friar Bacon and Friar Bungay*, printed by Edward White, in quarto (1594), and played at Devonshire House in 1591. A prose work, first printed in 1627, was reprinted in Thoms's *Early English Prose Romances* (Pickering, London, 1828), under the title of *The History of Friar Bacon*.

FRIAR-BIRD (so called from its bare head, the ruff of feathers about its head, and its sober plumage). A well-known Australian honey-eater (*Philemon corniculatus*). It also has other names, as 'Pimlico' and 'four o'clock,' imitative of its loud cry. Several species of the genus inhabit Australia and the Malayan islands to the northward. All are dull drab in color, have the head and neck more or less bare of feathers, and the culmen of the large curved bill furnished with an excrescence. They inhabit the tree-tops, go in small flocks, and are strong, bold, noisy birds, well able to defend themselves. An interesting circumstance connected with them is the fact that in each island where a local species exists there also exists an oriole which 'mimics' its appearance perfectly (see MIMICRY), and thereby escapes much harm from enemies that might easily overcome it did they not mistake it for the more powerful friar-bird. Consult Wallace, *Darwinism* (London, 1889).

FRIAR RUSH. See RUSH, FRIAR.

FRIAR'S TALE, THE. In Chaucer's *Canterbury Tales*, the tale told by the friar Hubert. An archdeacon's summoner enters into a compact

with Satan, whom he meets disguised as a yeoman, and is himself carried off by the fiend.

FRIAS, fré'ás, TOMÁS (1805-84). A Bolivian statesman, born at Potosi. He was Secretary of State under several Presidents, until the assassination of Morales in 1872, when he was selected to conduct the affairs of the Government as Acting President. Upon the installation of Ballivian (May, 1873), he became Vice-President, and after the death of the latter succeeded to the Presidency (February 14, 1874). Two years after the completion of his term of office (1877) he was sent as Minister to France. He was considered one of the foremost statesmen of South America, and his influence upon the political development of Bolivia can scarcely be overestimated.

FRIBOURG, fré'boor', or **FREIBURG**, frí'boork. A western canton of Switzerland, situated between the cantons of Bern, Vaud, and Neuchâtel (Map: Switzerland, B 2). It has an area of 645 square miles. The southeastern part is high, and may be said to belong to the Bernese Oberland region; the northwestern part belongs to the basin of Lake Neuchâtel. The main rivers are the Saane and the Broye. The mountain forests furnish wood for export; limestone, gypsum, and pitch coal are found. Of the total area, 88 per cent. is productive. Grain, fruit, potatoes, tobacco, and grapes are grown. Dairy products, especially cheese, are exported. Fribourg produces a fine grade of draught-horses, and gives its name to an excellent breed of black cattle. Its manufactures are not important. They include watches, paper, tobacco and cigars, glass, and products of the loom. Straw-plaiting and tanning are leading industries. The canton is administered by a Grand Council, elected by the people, one member for every 1200 inhabitants, and by a State Council consisting of seven members. It sends six representatives to the National Council.

The population in 1888 was 119,155; in 1900, 127,951. The inhabitants are mostly Catholics. French is the official language of the canton, though legislative measures are published also in German. The educational institutions comprise the university at the capital, Fribourg (q.v.), a seminary, a college, and many secondary, elementary, and industrial schools. The ancient dwellers of the land were the Celtic Helvetii. During the great barbaric migrations the district was occupied by the Alemanni in the east and the Burgundians in the west. In the sixth century it came into the possession of the Franks. It passed under the control of the Holy Roman Empire in 1032. The inhabitants refused to allow the spread of Protestantism within their borders. In 1798 the French occupied the land, and it remained under French influence till 1814. The canton, which has always been ultramontane and conservative, is the only one without the referendum and with restricted popular rights. Consult: Berchtold, *Histoire du canton de Fribourg* (Freiburg, 1841-45); Marrot, *Chronique du canton de Fribourg* (ib., 1878).

FRIBOURG, or **FREIBURG**. The capital of the Swiss canton of the same name, situated on the Saane, 19 miles southwest of Bern (Map: Switzerland, B 2). The town stands on a promontory, is ancient, and is irregularly built, with many walls and towers. The river is crossed by

a number of fine bridges, including two of the suspension type, of which the larger, built in 1832, is 828 feet long. The most notable buildings are the Church of Saint Michael, formerly belonging to the Jesuits, and the town hall, with its Gothic clock-tower. Among the educational institutions are the university (founded in 1889), the College of Saint Michael, and the lyceum, containing the cantonal museum. The chief manufactures of the town are tobacco, pasteboard, leather, and artistic objects. Two-thirds of a mile south of the town the Saane is dammed. The water-power thus derived is made use of by the factories. Population, in 1888, 12,195; in 1900, 15,794.

FRIČ, or **FRICTSCH**, frích, ANTON JOHANN (1832—). A Bohemian geologist and zoölogist, brother of Joseph Václav Frič, born and educated at Prague. He became professor in the Czech University at Prague and was also director of the zoölogical and paleontological department of the Museum of Bohemia. A skilled ornithologist and ichthyologist, he did much to develop Bohemian fisheries. Among his writings are: *Les oiseaux d'Europe* (1832); *Naturgeschichte der Vögel Europas* (1853-71); *Cephalopoden der böhmischen Kreideformation* (1872); *Geologische Bilder aus der Vorzeit Böhmens* (1873); *Die Reptilien und Fische der böhmischen Kreideformation* (1878); *Fauna der Gaskohle und der Kalksteine der Permformation Böhmens* (1879 sqq.); *Fischereikarte des Königreichs Böhmen* (1888); and *Der Elbelachs* (1894).

FRIČ, JOSEPH VÁCLAV (1829-90). A Bohemian poet, born in Prague. He took so active part in the risings of 1848-49 that he was punished by imprisonment and exile. He went to London in 1859, then to Paris and to Berlin, and in 1879 returned to Prague. His literary productions include the violent anti-Austrian pamphlet, *Pláč koruny české* (1866); contributions to the Czech periodicals *Blaník* and *Correspondance tchèque*, and to the *Agramer Zeitung* (1870-77); the historical work, with Leger, *La Bohême historique, pittoresque et littéraire* (1868); the dramas *Svatopluk*, *Ulryk Hutten*, and *Mazeppa*; and lyric poems in a Byronic manner, of which *Upír* (1849) is the best example. His collected works, *Sebrané spisy*, were published at Prague (1879-80), and his memoirs appeared in four volumes (Prague, 1885-87). He frequently used the pseudonym 'Brodsky.'

FRICTION (Lat. *frictio*, a rubbing, from *fricare*, to rub). If a solid body with a flat surface rests on a horizontal table, it requires a definite force to start it moving; and if it is set in motion, it will come to rest unless acted upon by a sufficient force. These phenomena are said to be due to the force of 'friction' between the two surfaces. It is found by experiment that the force required to start the motion of one body over the other varies directly as the force pressing the surfaces together, but is independent of the area of contact. The ratio of the force required to produce motion to the force pressing the surfaces together is called the 'coefficient of statical friction.' It varies largely for different kinds of material, and is always diminished by lubricants.

Similarly, if one body is caused to slide over the other, a definite force is required to prevent its motion being retarded; in other words, a force

is required to maintain a uniform speed. This force bears a definite ratio to the force pressing the surfaces together, which is called the 'coefficient of kinetic friction,' and is independent of the area of contact. This coefficient is different for different materials, and for the same substances is less than 'the coefficient of statical friction.' It is independent, further, within certain limits of the degree of speed. Some values of this coefficient of kinetic friction are as follows: Oak on oak, fibres parallel, 0.48; the same, with surfaces rubbed with dry soap, 0.16; iron on oak, fibres parallel to motion, 0.62; iron on iron, surfaces well lubricated, 0.04.

The resistance noticed when a wheel rolls on a plane surface with no slipping is not a true case of friction, although it is sometimes called 'rolling friction.' It is due to the plane surface becoming deformed and rolled up in front of the advancing wheel, or to the wheel itself flattening out. This opposition is, however, in most cases extremely small, when compared with sliding friction. Whenever work is done in overcoming friction, the surfaces which are rubbed over each other experience heat effects, and thus friction always causes loss of available mechanical energy. On the other hand, without friction most motions would be impossible—e.g. a man walking, a belt driving a pulley, a train moving on a track, etc. If there were no friction, all these motions would necessarily be produced by cog-wheels or their equivalents.

Friction between solids is due to slight unevennesses on the surfaces in contact, and is therefore what may be called a force between the minute portions of the bodies, and heat effects are produced. The exact mechanical explanation is not evident. In the case, however, of friction between moving layers of liquids or gases it is. It is known that all molecules of these forms of matter are moving about at random through distances which are considerable with respect to their own size; if, then, a layer of fluid is moving relatively with reference to a contiguous layer—e.g. the currents produced in a tumbler of water by stirring a spoon in it, or the currents of air produced by whistling—molecules move freely from one layer into the other. The effect is exactly that of having two long trains of cars, or movable platforms, on parallel tracks, one train in motion, the other not; if enough people step back and forward from one train to the other, the moving one will be slowed up, the one at rest will be set in motion, and finally both trains will be moving at the same speed. If one train is kept at rest, the other will be brought to rest also. Thus, moving layers of liquids and gases are brought to rest. The kinetic energy of the currents goes into increasing that of the molecules, and the temperature is raised. Friction between layers of fluids is sometimes called 'viscosity,' and a fluid is said to be 'viscous' if this frictional force is large.

There is thought to be little, if any, friction between a fluid and a solid, when, for example, the fluid is flowing through a pipe or tube; in general there is a layer of the fluid close against the solid and attached to it, so that any friction is between this layer and the rest of the fluid. In case of a liquid which does not 'wet' a definite solid, the conditions are of course different.

There is still another case of friction to be considered, that between portions of a solid body when it is making elastic vibrations; e.g. a vibrating tuning-fork or spiral spring. When any solid is deformed there is always to a greater or less degree a slipping of layers of the solid over each other, and thus there is produced 'internal' friction. Owing to this, the energy of vibration of the body decreases, the vibrations cease, and the body as a whole has its temperature raised.

FRIDA, frē'dá, EMIL BOHUSCH (1853—). A Czech poet, whose pen-name is Jaroslav Vrchlický. He was born at Laun, Bohemia, was educated at Prague, and was appointed professor of literary history in the Czech university there in 1893. In 1901 he was called to the Austrian House of Peers. His poetic works comprise epics, tragedies, comedies, several novels, and translations from the best writers of France and Italy. Many selections from his works have been translated into German.

FRIDAY (AS. *Frigedæg*, *Frigdæg*, OHG. *Friatag*, Ger. *Freitag*, from AS. *Frige*, OHG. *Fria*, Icel. *Frig*, a goddess partly identified with the Roman Venus + AS. *dæg*, Ger. *Tag*, day; a German translation of the Latin name *dies Veneris*, day of Venus, whence It. *venerdì*, Fr. *vendredi*, Friday). The sixth day of the week. Among the Germanic peoples it was sacred to the goddess named above, the wife of Odin. In the Christian Church it was in very early times consecrated to the commemoration of the crucifixion of Christ, which took place on that day. (See GOOD FRIDAY.) The superstition that Friday is an unlucky day may probably be traced to association with this event. Clement of Alexandria, Epiphanius, and other early writers describe the custom of marking it by fasting and prayer. In the Roman Catholic Church it has always and everywhere been a day of abstinence from flesh meat, except when Christmas falls on a Friday. The Anglican churches also designate all Fridays (with the same exception) as days of fasting or abstinence. Since the spread of the devotion to the Sacred Heart of Jesus in the last two centuries, the first Friday of every month has been a day marked for devout Roman Catholics by special observances in honor of it. Among the Mohammedans it is the day for religious gatherings, said to have been chosen by Mohammed in memory of the creation of man, as well as to differentiate his followers from Jews and Christians. They are not required to rest from labor except during the time of the Friday midday prayer, at which all adult males are required to be present. Those who absent themselves on three successive Fridays without a valid excuse are considered to have renounced their faith.

FRIDAY. In Defoe's *Robinson Crusoe*, a savage whom Robinson Crusoe saved from death on Friday, and who became his faithful servant.

FRIDAY CLUB, THE. A social club, started by Sir Walter Scott, in June, 1803. It met at Fortune's Tavern, and was probably modeled on Johnson's famous 'Club' at the Turk's Head. A list of the members is given in Lockhart's *Life of Scott*, vol. ii. (Edinburgh, 1850).

FRIDERICIA, fré'dá-ré'sé-á, JULIUS ALBERT (1849—). A Danish historian. He was born and educated at Copenhagen, and was appointed assistant librarian at the university library in that city in 1891. Many of his works are based upon a careful study of the archives of Denmark, Sweden, Holland, England, Germany, France, and other European countries. His principal works comprise: *Danmarks ydre politiske Historie i Tiden fra Freden i Lybek til Freden i Brömsebro*, 1629-60 (1876-82), and *Adelsvældens sidste Dage, Danmarks Historie fra Christian IV's Død til Enevældens Indførelse* (1894). In collaboration with Bricka he published *Christian IV's egenhændige Breve* (1878-91).

FRIDOLIN, fré'dó'lán', or **FRIDOLD**, fré'dólt (less frequently TRIDOLIN, or TRUDELIN), SAINT. A Christian missionary of the sixth century, called 'the First Apostle to Allemannia.' All that is known of him is derived from a life written four centuries later by Balther, a monk, and containing a great amount of legend, intermingled with historical fact. According to this work, he was a Scot, who, after labors among his heathen countryfolk, went to Poitiers, where he restored the Church of Saint Hilary, much impaired through Arian heresy, to its former prosperity. He afterwards founded a church and a monastery on the island of Säkingen, in the Rhine. He is the patron saint of the Canton of Glarus, Switzerland, on whose coat-of-arms he appears. His day is March 6th. An edition of Balther's *Life* is contained in Mone's *Quellensammlung der badi-schen Landesgeschichte*, vol. i. (Karlsruhe, 1845). Consult also: Heber, *Die vorkarolingischen Glaubenshelden* (Göttingen, 1867), and Heer, *Sankt Fridolin, der Apostel Alemanniens* (Zurich, 1888).

FRIEDBERG, fréd'bérk, EMIL ALBERT (1837—). A German canonist. He was born at Konitz, West Prussia, and was educated at Berlin and Heidelberg. After having been professor in the universities of Halle and Freiburg, he was appointed a member of the faculty at Leipzig in 1869. The new critical edition of the *Corpus Juris Canonici* (1879-81) was prepared by him, as was also the *Formelbuch des Deutschen Handels-, Wechsel- und Seerechts* (3d ed. 1894). Alike in his collaboration in the Prussian Church laws of 1872 and as an author, he showed himself a champion of State supremacy in ecclesiastical matters, and many of his works deal with this subject in its various bearings. Perhaps the best known of his numerous publications are the following: *Die Geschichte der Civilehe* (2d ed. 1877); *Lehrbuch des katholischen und evangelischen Kirchenrechts* (3d ed. 1889); and *Verfassungsgesetze der evangelisch-deutschen Landeskirchen* (1885 et seq.).

FRIEDEL, fré'dél', CHARLES (1832-99). A French chemist and mineralogist, born at Strassburg. He was educated at the Protestant gymnasium, and subsequently studied, under Pasteur, at the University of Strassburg. After spending a short time in his father's banking business, he went to continue his studies in Paris, where he resided with his grandfather, the celebrated zoölogist Duvernois. After a thorough preparation in the mathematical sciences, he entered the laboratory of Wurtz, with whom he soon formed a close friendship. In 1869 he pre-

sented two remarkable theses, one in organic chemistry and one in mineralogy, which immediately attracted to him the attention of the scientific world. In 1871 he became instructor in mineralogy at the Ecole Normale Supérieure, and in 1876 succeeded Delafosse as professor of mineralogy at the Sorbonne. Two years later he succeeded Regnault as member of the Institute. On the death of Wurtz, in 1884, Friedel was appointed professor of organic chemistry and director of the research laboratory at the Sorbonne, a position which he retained to the end of his life. In 1892 he organized and became director of the Ecole de Chimie, a school of industrial chemistry connected with the University of Paris. Friedel's researches contributed extensively to the development of organic chemistry and synthetic mineralogy. The results embodied in his two hundred and fifty-four original memoirs have, without a single exception, joined the structure of science as valuable and indisputably correct data. His classic researches on the acetones, his discovery of the secondary alcohols, his total synthesis of glycerin, his discoveries of many new mineral species and of methods of reproducing many minerals artificially, his discovery of the pyro-electric properties of minerals, his researches on the chemistry of silicon and its organic compounds, and his discovery, jointly with James Mason Crafts, of the synthetic method well known as 'the Friedel and Crafts reaction,' entitle him to a place among the foremost experimental scientists of the nineteenth century. The Friedel and Crafts reaction consists in the action of various chlorinated compounds on hydrocarbons in the presence of aluminum chloride, thousands of different organic compounds being thus conveniently prepared on any ordinary scale. For example, triphenyl methane, which is employed in the manufacture of a number of valuable dyes, can thus be readily prepared in any desirable quantity. As to the compounds of silicon, Friedel, working in conjunction, partly with Crafts, partly with Ladenburg, showed that the element silicon is, like carbon, quadrivalent, and obtained a series of compounds perfectly analogous to the hydrocarbons and capable of yielding many substances perfectly analogous to derivatives of the hydrocarbons. Friedel's book-form publications include a text-book of mineralogy and crystallography, and a work on organic chemistry, entitled *Cours de chimie organique professé à la faculté des sciences de Paris* (2 vols., 1887).

FRIEDELITE. A crystalline mineral magnesium chloro-silicate discovered by Bertrand in the mines of Adervielle. It has a dark-red color and is translucent. It was named in honor of Charles Friedel (q.v.).

FRIEDENTHAL, fré'den-thäl, KARL RUDOLF (1827-90). A German statesman. He was born at Breslau, and was educated at Breslau, Heidelberg, and Berlin. He became a member of the North German Reichstag in 1867, and was one of the founders of the party known as the Free Conservatives. He was a member of the conference convened at Versailles during the Franco-German War to assist in framing the Constitution of the new German Empire. In 1874 he was appointed Minister of Agriculture, and resigned his post in 1879. His influence upon the economic

development of the German Empire was most important.

FRIEDERIKE VON SESENHEIM, frë'dër-ê'ke fôn sâ'zen-him. See BRION, FRIEDERIKE ELISABETH.

FRIEDLAND, frëd'lânt, *Eng. pron.* frëd'land. A town of East Prussia, on the left bank of the Alle, 26 miles southeast of Königsberg. It is celebrated as the scene of one of Napoleon's most splendid victories, gained over the Russians under Bennigsen, June 14, 1807. On June 10th the corps of Soult, Lannes, and Murat had delivered an attack on the Russian intrenchments at Heilsberg, and had been repulsed with a loss of nearly 10,000 men. Napoleon thereupon swung his army to the north of Heilsberg and took up the march for Königsberg, hoping by this manœuvre to entice the Russian commander from behind his fortifications. On the 11th Bennigsen abandoned Heilsberg, and for three days, till the 13th, the two armies were engaged in a race for the threatened town, the Russians advancing by the right bank of the Alle, the French to the left of the river, and at some distance away. On June 13th the corps of Murat and Davout were in the neighborhood of Königsberg; Soult was at Kreutzburg, about 10 miles south of Königsberg, and Lannes was at Domnau, some 15 miles southeast of Kreutzburg. Napoleon, with the Guard and the corps of Victor, Ney, and Mortier, was at Preussisch-Eylau, about five miles from Domnau. Early in the morning of June 14th Bennigsen began the crossing of the Alle at Friedland, in the hope, probably, of surprising Lannes's isolated corps. Had the passage of the river and the attack on Lannes been carried out with rapidity and decision, victory would have certainly resulted for the Russians. But Bennigsen's dilatoriness and Lannes's intrepid resistance allowed time for Napoleon to arrive on the field of battle with the main body of troops and to turn the advantage of numbers in favor of the French, 70,000 against 55,000. The position of the Russians was perilous in the extreme, with the greater part of their forces hemmed in within a narrow arc of the Alle curving behind them. In case of disaster their only means of retreat were the bridges across the Alle at Friedland. Against these bridges, as the key of the situation, Napoleon directed his attack. Mortier, on the left wing, was ordered to content himself with merely holding the enemy in check, while Ney, on the right, was sent against Friedland. The battle began about six o'clock in the afternoon. Ney advanced to the attack under cover of a heavy artillery fire, but his ranks were immediately thinned under the withering cannonade and were thrown back in utter confusion by a smashing charge of the Russian Household Cavalry. The corps of Victor and the division of General Dupont were thrown into the breach, while Sémarmont with thirty guns took up a position 100 yards in front of the infantry line and drove back the Russian cavalry, gaining time for Ney to rally his divisions. A charge by Latour-Maubourg's dragoons and a further advance of Sémarmont's batteries decided the fate of the battle. The Russians fled through Friedland pursued by Ney and Dupont, a part of the army with 120 guns reaching the right bank of the Alle before the bridges were burned. The Russian right, meanwhile, under Gortchakoff, had

been skirmishing with Mortier; upon the retreat of Bennigsen, Gortchakoff attempted to retake Friedland, but, failing, was forced to move northward along the river in search of a fording-place, losing one-third of his men in the passage of the river. The loss of the Russians in the battle was nearly 20,000 killed and wounded; the French loss was less than half that number. On June 19th Königsberg fell into the hands of the French; and on June 25th occurred the meeting between Napoleon and the Emperor Alexander at Tilsit (q.v.). Population, in 1900, 2824.

FRIEDLAND, VALENTIN (1490-1556). A German educator, generally called Trotzendorf, from the little village in Upper Lusatia where he was born, February 14, 1490. He taught for a time in the school at Görlitz, soon after obtaining his baccalaureate from the University of Leipzig; but, adopting the principles of Luther and Melancthon, he was obliged in 1518 to give up his instructorship. In 1523 he became rector of the gymnasium at Goldberg, in Silesia, for a brief period; he came a second time to Goldberg in 1531, in the same capacity, and remained for over twenty years, making the school so famous throughout Europe that it often had several hundred pupils at once. The school administration was modeled on that of the Roman Republic, thus affording a measure of self-government among the pupils; and Latin was the only language allowed in and out of school. The utter destruction of the buildings by fire in 1554 compelled a removal to Liegnitz, and here Friedland, while superintending the erection of new buildings at Goldberg, died, April 26, 1556. For his biography, consult Pinzger (Hirschberg, 1825) and Löschke (Breslau, 1856).

FRIEDLÄNDER, frëd'lën-dër, DAVID (1750-1834). A German Hebrew scholar. He was born in Königsberg, Prussia, and was attracted to Berlin by the reform movement under Mendelssohn. There he devoted himself to the emancipation of the Jews, and labored assiduously to improve their condition. He contributed to Mendelssohn's great biblical work, *Das Buch Koheleth* (1772), and also published: *Aktenstücke, die Reform der jüdischen Kolonie in den preussischen Staaten betreffend* (1793); *Sendschreiben an den Propst Teller von einigen Hausvätern jüdischer Religion* (1799); and *Ueber die Verbesserung der Israeliten im Königreich Polen* (1819).

FRIEDLÄNDER, FRIEDRICH (1825-1901). An Austrian painter, born at Kohljanowitz, Bohemia. He studied at the Academy of Vienna, and was a pupil of Waldmüller. Afterwards he studied abroad. His pictures, which are of genre or historical subjects, include: "The Death of Tasso" (1852); "The Interrupted Division" (1863); "Hour of Rest" (1865); "The War Veterans" (1875); "News" (1883); "Distribution of Wine" (1884); and the "Mont-de-Piété" (1886).

FRIEDLÄNDER, JULIUS (1813-84). A German numismatist. He was born in Berlin, and was educated at Bonn and Berlin. During the last thirty years of his life he was director of the cabinet of coins in the Berlin Museum, which establishment was greatly enlarged under his management. He edited the *Aufsätze und Briefe* of G. Schadow (2d ed. 1890), and published works on the coins of the Knights of Saint John

(1843), the coins of Justinian (1843), and on those of the Ostrogoths (1844) and Vandals (1849); also a monograph entitled *Das königliche Münzkabinett* (with Sallet, 2d ed. 1877).

FRIEDLÄNDER, LUDWIG (1824—). A German classical philologist and archaeologist, born at Königsberg. He was educated at the gymnasium of his native town and at the universities of Leipzig and Berlin. He became privat-docent at Königsberg in 1847, and full professor in 1858. In 1892 he retired, and has since lived in Strassburg. Friedländer's studies have been chiefly concerned with Roman archaeology and the history of Homeric criticism. His most important works are: *Die homerische Kritik von Wolf bis Grote* (1853); *Analecta Homerica* (1859); *De Operibus Anaglyphis in Monumentis Sepulcralibus Græcis* (1847); *Ueber den Kunstsinne der Römer in der Kaiserzeit* (1852); *Darstellungen aus der Sittengeschichte Roms*, etc. (6th ed. 1889-90); and an edition of *the Cena Trimalchionis of Petronius* (1895).

FRIEDMANN, fréd'mán, ALFRED (1845—). A German author and poet. He was born at Frankfurt-on-the-Main, was educated at Heidelberg and Zurich, and became established at Berlin in 1886. He is distinguished alike as a poet and novelist, his poetic productions being characterized by a thorough mastery of form and diction. His works include: *Die Feuerprobe der Liebe*; *Angioletta*, two poems (3d ed. 1879); and the novel *Zucci Ehen* (3d ed. 1890). His more recent novels are entitled *Inez de Castro* (1898), and *Tantalus* (1901).

FRIEDREICH, fréd'rík, NIKOLAUS (1825-82). A German physician. He was born at Würzburg, and was educated in that city and at Heidelberg. In 1857 he was appointed professor of pathology in the University of Würzburg, and director of the Anatomical Institute. From 1858 until his death he held the chair of pathology and therapeutics at Heidelberg, and was clinical director there. In addition to "Die Krankheiten der Nasenhöhlen, des Larynx und der Trachea," in Virchow's *Handbuch der speciellen Pathologie* (1854), he published a valuable work on cardiac diseases, entitled *Die Krankheiten des Herzens* (2d ed. 1867).

FRIEDRICH, fréd'rík, JOHANNES (1836—). A German theologian and historian, prominent as a leader of the Old Catholics. He was born at Poxdorf, studied at the universities of Bamberg and Munich, was ordained a Catholic priest in 1859, and in 1865 became professor of theology in the University of Munich, and in 1867 a member of the Academy of Sciences. The most noticeable of his works is the *Kirchengeschichte Deutschlands* (1867-69). He was a pupil of Döllinger, and in 1869 was called to the Vatican Council at Rome. His *Tagebuch während des Vatikanischen Konzils geführt* (1871) and *Documenta ad Illustrandum Concilium Vaticanum* (1871) are important sources of information concerning the proceedings. This council indorsed the Papal infallibility dogma, which Friedrich with Döllinger strongly opposed. Friedrich was consequently excommunicated in 1871, and in 1882 the Minister of Public Worship, yielding to Ultramontane pressure in the Chamber, transferred Friedrich from the chair of theology to that of history. He opened in 1874 the Old-Catholic theological faculty at the University of Bern, and lectured

there for a year. Among his works may be mentioned: *Der Mechanismus der vatikanischen Religion* (1870); *Geschichte des Vatikanischen Konzils* (1877-87); *Beiträge zur Geschichte des Jesuitenordens* (1881); *Johann Adam Möller, der Symboliker* (1894); and *Jacob Frohschammer* (1896).

FRIEDRICH, JOHN (1858—). An American violin-maker, born at Cassel, Germany. He was a pupil of Oswald Mückel, a prominent German violin-maker and repairer, came to the United States in 1883, and in a short time ranked among the American leaders in his profession. In addition to violins he has made also bows, violas, and violoncellos of high quality. He received the highest award bestowed for violins, violas, and violoncellos at the World's Columbian Exposition, Chicago, 1893. He has also become known among collectors as an expert in the identification and valuation of rare instruments. Four of the choicest specimens of his violins are in the possession of Dr. Frank Waldo, of Cambridge, Mass.

FRIEDRICH, KASPAR DAVID (1774-1840). A German landscape painter, born at Greifswald. First instructed there by Quisdorf, he studied afterwards at the academies of Copenhagen and Dresden, and fed his fancy in the course of his wanderings on the Baltic coast, in the island of Rügen, and later among the Harz Mountains and the Riesengebirge, became one of the principal exponents of the then dawning romanticism in art. In 1817 he was made a member of and professor at the Dresden Academy. A masterly series of drawings in sepia, depicting scenery in Rügen and other regions near the Baltic coast, are among his most highly prized works. Prominent among his oil paintings are "View in the Harz," and "Moonrise by the Sea" (1823), in the National Gallery, Berlin; and "Repose During Hay Harvest" (1835), in the Dresden Museum.

FRIEDRICH, WOLDEMAR (1846—). A German historical painter and illustrator, born at Gnadau, Province of Saxony. He studied in Berlin under Steffek, and in Weimar under Plockhorst, Ramberg, and Verlat; took part in the Franco-German War of 1870-71, and after a visit to Italy, in 1873, returned to Weimar, where he was made professor at the School of Art in 1881. Called to Berlin in 1885 as instructor at the Academy, he was awarded the gold medal in 1886 for his allegorical ceiling-painting in the Exhibition Building. Among several other decorative works on a large scale are to be especially noticed "The Diet of Worms" (1892), in the Aula of the Gymnasium at Wittenberg, and the two mural paintings "Art and Science," and "Book-Trade and Printing," in the Booksellers' Exchange at Leipzig. A series of landscapes and genre pictures in water-colors and the illustrations to his work *Sechs Monate in Indien* (1893) were the fruits of a journey to India. In 1889 he became a member of and professor at the Berlin Academy.

FRIEDRICHSRUH, fréd'ríks-roō. A village and railway station of Lauenburg, Prussia, 16 miles southeast of Hamburg by rail. Population, in 1900, 279. Its celebrity is derived from the proximity of the castle and estate of the Bismarck family, where Prince Bismarck (q.v.) died and is buried.

FRIENDLY, Sir JOHN. A character in Vanbrugh's *The Relapse*, the model of Colonel Townley in Sheridan's *A Trip to Scarborough*.

FRIENDLY ISLANDS. See TONGA ISLANDS.

FRIENDLY SOCIETY. The name given to English benefit associations established as a rule by the workmen themselves for certain forms of self-help, but now developed into mutual insurance societies. The origin of the friendly society is frequently ascribed to the mediæval guild. They began as sick-clubs composed of small groups, usually neighbors, who met at the public houses, uniting conviviality with the payment of sick benefits and funeral expenses. The large orders arose from the renewed interest of the eighteenth century in Free Masonry. At first they had no regular benefit funds, but grants were made to members in distress. After 1834, when the Poor Laws were changed and the opportunities for thrift were better, societies increased rapidly. Since 1870 an effort has been made to put them on a stronger financial basis.

In general the benefits given by friendly societies are for sickness and funeral allowances. The question of superannuation funds is now important. Other forms of benefit sometimes found are: endowments, insurance for shipwrecks, loss or damage to boats, nets, tools, or implements, medical aid dispensaries, widows' and orphans' funds, convalescent homes, asylums for the aged, and traveling relief for those out of employment. Formerly many local societies existed, but they are gradually disappearing. A frequent form was the dividing society, which shared the surplus at the end of the year. The strongly centralized societies have no social union, but only a business relationship with their members, as the dues are paid through agents or the post-office.

The members are usually clerks, tradesmen, or highly paid artisans. There are two kinds of societies, not properly friendly societies: (1) deposit societies with savings-bank features; and (2) burial societies—some merely local clubs, others large societies with many abuses, in which the cost of the management is 40 to 55 per cent., and which appeal to the poorest classes. Many children are insured in them. There are funeral and local factory and shop clubs for particular trades—often compulsory and subsidized by employers. The large railroad and coal-mining societies provide principally for accidents. The most important friendly societies are the affiliated orders, including the temperance societies and containing the pick of English workmen and of the lower middle class. The orders are democratic social centres, thoroughly educational in character. Societies for women have not been very successful. The United Sisters' Friendly Society (1885), however, promises well. Juvenile branches lately started have prospered.

Many friendly society acts have been passed since 1783. The act of 1875 is especially important. Royal commissions have made valuable reports (especially those of 1825-27 and 1870-74), showing the weaknesses due to small contributions, mismanagement, and competition. These reports and permissive legislation, providing a legal status and supervision, have aided reform. The solvency of many societies is doubtful. Many societies are still unregistered, and hence sta-

tistics are inaccurate. In 1892 there were 29,742 societies, of which 24,598 gave in returns, comprising 8,320,262 members and funds amounting to £26,003,061. The Independent Order of Odd Fellows, Manchester Unity (1822), with 698,328 members in 1897, and an income of £1,294,233, and the Ancient Order of Foresters (1835), with 656,919 members, and an income of £1,240,559, are the leading affiliated orders. The Heart of Oak Benefit Society and the Rational Aid and Burial Association are representative of the centralized associations. Since 1870 the friendly societies have formed an association to watch legislation and protect their interests. This has led to coöperation through medical aid associations and investment associations. Scotland has many societies; they are a later growth in Ireland; several have been introduced into Australia, Canada, and the United States. The friendly society has an important place in the development of the English workingman, but it does not reach equally all grades of the working class, especially the very poor and helpless. Consult: Baernreither, *English Associations of Working Men* (trans. by Alice Taylor, London, 1893); Wilkinson, *The Friendly Society Movement* (London, 1886); id., *Mutual Thrift* (London, 1891); *Nineteenth Century*, 45, 891. See BENEFIT SOCIETIES; INSURANCE; OLD-AGE PENSIONS; POOR LAW.

FRIEND OF MAN, THE. A sarcastic popular title for Victor Riquetti, Marquis de Mirabeau, the father of the revolutionist. It was suggested by the title of his work, *L'Ami des Hommes*.

FRIENDS, THE, or THE SOCIETY OF FRIENDS. A denomination of Christians often known as Quakers, dating from about 1647. In spite of cruel and severe persecutions, the Friends succeeded in establishing themselves in Europe and America. They have never been numerically powerful, having at no time exceeded, if indeed they have ever reached, 200,000 members; but the purity of life which has so honorably distinguished them as a class, has unquestionably exercised a salutary influence on the public at large; while in respect to certain great questions affecting the interests of mankind, such as *war*, *slavery*, and *oaths*, they have, beyond all doubt, originated or emphasized opinions and tendencies which are no longer confined to themselves, but have widely leavened the mind of Christendom.

HISTORY. The founder of the Friends was George Fox (q.v.), who was born in Fenny Drayton, Leicestershire, England, 1624. He began to preach about 1647, and soon drew around him many who, like himself, were "dissatisfied with the teachings and practices of the day, and were longing for a higher and more spiritual life." Neither Fox nor his adherents at first had any intention of establishing a new branch of the Church. Such a result, however, was inevitable from the doctrines which they preached, for such were practically incompatible with the practices of the denominations then existing.

For three or four years Fox's missionary labors were, for the most part, confined to the central part of England. But in 1652 he came into Lancashire, to Swarthmoor Hall, near Ulverstone, the residence of Judge Fell and his wife, Margaret. This able woman became one of Fox's strongest adherents and supporters. From her

house as a centre, a band of sixty Quaker missionaries went forth to preach the doctrines of the new religious movement. The continual travels of Fox, and the labors of this band of preachers, enforced by the simplicity, the truthfulness, and the spiritual power of their message, soon gathered thousands of adherents. It is estimated that in London alone there were 10,000. It has often been said that these early preachers were ignorant men from the lower classes. Such a statement is very far from being the truth, as among them were former Independent ministers, officers of Cromwell's army, schoolmasters, and not a few persons of property.

The doctrines held by the Friends, and their refusal to take any oath, to pay tithes, to obey laws deemed by them iniquitous, such as the 'Conventicle Act' and the 'Five-mile Act,' brought them into constant conflict with the authorities. During the twenty-five years of the reign of Charles II. 13,562 were imprisoned in various parts of England, 198 were transported as slaves, and 338 died in prison or of wounds received in attacks upon their meetings. It was not until after the Revolution of 1688 that they were secure from serious molestation.

The increase in numbers made necessary some kind of organization. That adopted was almost wholly the work of Fox, and in its essential features is still preserved, as described below.

After the time of persecution came a lull in the history of the denomination, and more attention was given to internal affairs than to missionary effort. The 'discipline' was administered rigidly, and the number of members diminished greatly during the eighteenth and first half of the nineteenth centuries. Still, as in America, great attention was paid to philanthropic work. Later, foreign and home mission work was actively entered into, the loss in membership was checked, and a new spirit of earnestness, which still continues, pervaded the body.

The Quaker movement was not confined to England; it spread to Scotland, to Ireland, in some degree to the Continent, and in 1656 to America. In that year Ann Austin and Mary Fisher arrived in Massachusetts. They were cruelly treated, imprisoned, and then sent back to Barbados, whence they had come. Similar harsh treatment meted out to others, or even the execution on Boston Common (1659-61) of three men and one woman (see BOSTON; DYER, MARY), did not deter Friends from visiting America. In spite of persecution, converts were made and meetings established in nearly all the English colonies. George Fox himself traveled in America. 1671-72.

Notwithstanding their small numbers, the Friends exercised no little influence in Rhode Island, New Jersey, Virginia, and Maryland. Perhaps the most important incident in their history, whether in the Old or New World, was the settlement of Pennsylvania by William Penn in 1682, and the control of that Colony by the Friends for about seventy years. See PENNSYLVANIA.

Soon after the cessation of persecution the Friends withdrew from active aggressive movements and turned their attention to perfecting and administering their discipline; to the practice of philanthropy, notably to the extinction among their membership of the custom of holding

slaves, and to labors in the general anti-slavery cause, also to caring for the American Indians, improving the condition of prisoners, the insane, etc. The rigid application of the 'Discipline,' especially the 'disowning' (depriving of membership) of those who had married non-members, was one of the chief causes of a steady decline in membership which increased in extent as the years went on. The greatest blow to the Friends, however, was the 'separation of 1827-28.' This was a schism due to several causes. The immediate occasion was the preaching and teaching of Elias Hicks (q.v.), a prominent Friend. He promulgated doctrines closely approaching what are usually known as Unitarian views. He also made statements which seemed to undervalue the Holy Scriptures and their divine authority. More than one-half of the Friends in the Middle States followed Hicks, but they were largely in the minority as compared with the whole body of Friends. The larger party was reorganized by the London Yearly Meeting in England. The two divisions are often called 'Orthodox' and 'Hicksite,' and are so distinguished in the United States Census Reports. Neither name is strictly accurate. The smaller division prefer to be called the 'Liberal Branch.'

The effect of the schism upon the 'Orthodox' body was to bring about a movement in favor of a higher education, and a doctrinal belief more nearly allied to that of the so-called 'evangelical' bodies. The leader in this movement was Joseph John Gurney (q.v.), a highly educated and prominent Friend of Norwich, England. This new tendency, however, excited considerable opposition among some of the 'orthodox' Friends in America, which resulted in another separation. These separatists were called 'Wilburites' from John Wilbur, the leader of the movement. The points of difference did not concern the essentials of Christianity, but rather their practical application, and also points of discipline and methods of administration. This schism was not general, and the number of separatists was small.

There remains still another body called the 'Primitive Friends.' They may be described as ultra-Wilburite. They number less than 250 members.

The Friends in Great Britain and Ireland do not differ in any important respects from their brethren in America. Owing to the conscription laws which prevail on the Continent of Europe, it has been almost impossible for the Friends to maintain meetings there. In all, only about 250 members are found. In Australasia there are about 500, and there are a few in Turkey and in Asia.

DOCTRINE. It is perhaps more in the spirit than in the letter of their faith that the Friends differ from other orthodox Christians. This was so from the first. The epistle addressed by George Fox and other Friends to the Governor of Barbados, in 1671, contains a confession of faith not differing materially from the fundamental doctrines of evangelical bodies. The Friends have no formal creed or confession, and they have avoided the use of technical theological phraseology. Declarations of faith, however, have been issued from time to time, notably in 1693, 1829, and 1887. In all of these the position taken on essential points of doctrine is substantially the

same as that of the great bodies of Protestant Christianity.

Their most distinguishing doctrine is that of the immediate personal teaching of the Holy Spirit to the individual. This has often been called the 'Inner Light,' or the 'Christ Within.' This doctrine has often been misunderstood. Some of the early Friends themselves are not clear in their statements regarding it. George Fox unquestionably states the doctrine truly when he says, "I saw that the grace of God which brings salvation had appeared to all men, and that the manifestation of the Spirit was given to every man to profit withal." "The Lord opened to me," he says in another place, "how every man was enlightened by the divine light of Christ." Robert Barclay in the *Apology* taught that even the heathen were illumined by this light, though they might not know—as, indeed, those who lived before Christ *could* not know—the historical Jesus in whom Christians believe. In consequence of this view the Friends held that every one who lived up to the light which he had would be accepted of God. This fact, however, in no wise relieved the individual from the duty of seeking to obtain more light; neither did it relieve those who had the Gospel from the duty of carrying it to those who had it not. The early Friends were among the most active Protestant missionaries of their day. The doctrine of the direct manifestation of the Holy Spirit to the individual lies at the root of most of their special doctrines. It is the Holy Spirit who calls and qualifies for religious service, therefore all believers are 'priests unto God,' and there is no division into clergy and laity.

The Friends, at times, have been charged with undervaluing or at least neglecting the Holy Scriptures. At one time there was in certain places some foundation for this charge, but it arose from a misconception of the fact of divine guidance, and was contrary to the oft-repeated official declarations of the body and of its most respected leaders.

PRACTICE. It follows from the doctrine that the Holy Spirit calls and qualifies whom He will for religious service, that the Friends do not consider human learning a necessary qualification for the minister of the Gospel. They believe that the call to this work, now, as of old, is 'not of men, neither by man,' and that it is bestowed irrespectively of rank, talent, learning, or sex. Consequently they have no theological schools or professors of divinity. At the same time education is not undervalued, and provision is made in nearly all their colleges and higher schools for instruction in Church history, biblical languages, and allied subjects, but above all in the Bible itself. These courses are, however, not restricted to any class, but are open to all.

As fitness for the ministry is held to be a free gift of God through the Holy Spirit, so it ought to be freely bestowed upon others. But on the other hand, whenever ministers are engaged from home in the work of the ministry, they are, in the spirit of Christian love, freely entertained and have all their wants, including traveling expenses, supplied. Of recent years in some places and under some circumstances, a minister receives partial or even whole support: but neither by minister nor by congregation is the ministry

put upon a pecuniary basis, neither is it looked upon as a means of livelihood.

Their mode of conducting public worship likewise illustrates their dependence on the guidance of the Holy Spirit. The Friends meet and usually remain in silence until some one believes that he is called upon by the Spirit to speak in exhortation, praise, prayer, testimony, instruction, or the ministry. It follows from this that there may be several communications of different kinds in the same meeting, and the exercise may be from old or young, male or female, from those who are recorded ministers, or from those who are not.

Friends reject the ordinances of baptism and the eucharist as these are observed by other Christians. They believe that the true Christian baptism is a spiritual one, and not one with water. They believe that the true communion is inward and spiritual, and consists not in any symbolic breaking of bread and drinking of wine, but in that daily communion with Christ through the Holy Spirit, and through the obedience of faith, by which the believer is nourished and strengthened. They believe that Christ did not command *any* outward ordinance; that if the true spiritual baptism is experienced, and the true spiritual communion is partaken of, there is no need of any symbol. They believe, moreover, that the symbol tends to call attention away from the essential and beget a reliance upon the outward and non-essential.

The taking and administering of oaths is regarded by the Friends as inconsistent with the words of Christ, "swear not at all," and with the injunction of the Apostle James, "Above all things, my brethren, swear not, neither by heaven, neither by the earth, neither by any other oath; but let your yea be yea; and your nay, nay; lest ye fall into condemnation." They have also steadily refused to contribute to the support of a State Church.

The Friends have likewise consistently protested against war in all its forms; and they have repeatedly advised their members against in any way aiding or abetting military affairs. In support of this belief the Friends have at various times suffered much in person and property. They regard the profession of arms and fighting as diametrically opposed to the general spirit of Christ.

The Friends may certainly claim to have cultivated the moral sense of their fellow-countrymen in regard to the emancipation of the slaves and the abolition of the slave trade. As early as 1688 the Friends of Germantown, Pa., made a written protest against slavery. The feeling that slavery was wrong continued to grow; through the labors of John Woolman, Benjamin Lay, Anthony Benezet, and others the feeling became a conviction of the body, and by the close of the eighteenth century slavery was banished from the Friends.

DISCIPLINE. By the term 'discipline' the Friends understand "all those arrangements and regulations which are instituted for the civil and religious benefit of a Christian Church." The necessity for such discipline made itself felt soon after the rise of the body, and the result was the gradual establishment of certain meetings or assemblies. These are four in number: first, the *preparative* meetings; second, the *monthly* meetings; third, the *quarterly* meetings; and fourth,

the *yearly* meetings. Preparative meetings are wholly subordinate to the monthly meetings; they have little power; they attend exclusively to local matters, and where they exist must report to monthly meetings. The decided tendency in America is to give them up, and in the new General Discipline they are discontinued. The monthly meeting is the executive power, so far as the membership is concerned, subject to appeal to the quarterly and yearly meeting. It decides in cases of violation of the discipline, and has the power of cutting off or disowning all who by their improper conduct, false doctrine, or other errors, bring reproach on the body. The quarterly meetings are composed of several monthly meetings and exercise a general supervision over the latter, from which they receive reports, and to which they give such advice and decisions as they think right. The quarterly meetings send representatives to the yearly meeting. The term yearly meeting is used in two senses: first, the body of members who live within certain defined geographical limits; of this use mention will be made later on under the head Statistics; second, the annual assembly or conference, consisting primarily of representatives from the quarterly meetings; but every member has the right to take part in the deliberations and conclusions of the assembly. The function of the yearly meeting is to consider the condition of its membership in all its aspects. To it exclusively the legislative power belongs, and from its decisions there is no appeal. As its name implies, it is held but once a year, but in order that the interests of the body might not suffer between its sessions, a meeting was instituted first called the 'Meeting for Sufferings,' because its chief business was to take cognizance of the sufferings of Friends for conscience' sake; then, the 'Representative Meeting'; and still later the 'Permanent Board.' This body has stated times of assembling, but can, if necessary, be called together at short notice.

The officers of the organization are: first, *overscers*, appointed by each monthly meeting for a term of three years; they are two or more in number, usually equally divided between the sexes, and their duties are the oversight and watchful care of the membership; second, *elders*, two or more in number, of both sexes, appointed by monthly meetings with the approval of the quarterly meeting; they now usually hold office for three years; their chief duty is to exercise care over the ministry; third, *ministers*; as already implied, the Friends do not appoint ministers, but 'record' those upon whom they believe the gift is conferred through the Holy Spirit.

There is no doubt that a great change has come over the Friends. This is noticeable in externals rather than in doctrine. Any distinctive garb has been laid aside by almost all members; the use of the 'plain language'—'the thee and thou of the Quakers'—also, except familiarly among themselves, has been practically dropped; and the numerical names of the days and months are used only in official statements and among themselves. It is true some exception to these statements must be made more particularly in regard to the 'Wilburites' and the Friends in Philadelphia Yearly Meeting; but even in the latter the tendency is toward disuse. The discipline is administered in accordance with the spirit rather than the letter, and there is a general

falling away from formalism. In many of the meetings of the Middle West and West there are 'pastors' whose duty is pastoral visitation, and the care of the meetings for worship; where the whole time of the 'pastor' is given to such work a very moderate support is generally afforded, but this is an individual matter, and not a Church regulation.

The Friends are an active missionary body, and foreign missions are supported at various points in Madagascar, India, China, Japan, Africa, Mexico, Cuba, and Jamaica, and among the Indians of the United States and Alaska. There is an American Friends' Board of Foreign Missions, whose duty it is to have a general oversight, but not control, of the foreign missionary field. Great efforts have been made to bring about a closer union of the various yearly meetings, for they are now independent. This is shown by general conferences held at various times, and since 1887 every five years. From these conferences the plan of a regular meeting with defined powers to be held every five years has been adopted. This Five Years Meeting, as it is called, is composed of delegates from all the yearly meetings uniting in the plan; the first meeting was held in October, 1902, at Indianapolis, Ind. Besides this a 'Discipline' for all the American yearly meetings has been drawn up and has already been adopted by a majority, and probably will be adopted by all except one or two yearly meetings. This Discipline and the Five Years Meeting form the basis of a union which somewhat resembles that of the United States under the Articles of Confederation. It is too soon to forecast what the result of these efforts will be. All these remarks apply only to the 'Orthodox' body.

A pleasant feature of recent date is the 'Conference on Peace' which was held in Philadelphia in December, 1901. At this conference, for the first time since 1827, members of the different bodies who call themselves Friends met together on a common platform. Fewer changes are to be noted in the other bodies. The 'Hicksites' have not entered into the foreign mission field, but have been active in philanthropic efforts of various kinds, and the different yearly meetings have found a close bond of union in association for this philanthropic work.

The subject of education has claimed the earnest attention of both 'Orthodox' and 'Hicksite' bodies. The former, besides a number of boarding schools, have, for higher education, Haverford College, Haverford, Pa.; Guilford College, N. C.; Wilmington College, Wilmington, Ohio; Earlham College, Richmond, Ind.; Penn College, Oskaloosa, Iowa; Friends' University, Wichita, Kan.; Whittier College, Whittier, California; Pacific College, Newberg, Oregon. Bryn Mawr College for Women, Bryn Mawr, Pa., though controlled by Friends, is undenominational. The 'Hicksite' body has excellent schools, and Swarthmore College, for both sexes, at Swarthmore, Pa. During the past few years general summer schools for the study of religious history and biblical literature have been held at Haverford, Earlham, and Swarthmore Colleges, and elsewhere, besides other summer schools of more limited extent.

STATISTICS. The 'Orthodox' have 16 yearly meetings, viz.: London (for Great Britain), Dub-

lin, Canada, New England, New York, Philadelphia, Baltimore, North Carolina, Ohio, Wilmington (for southern Ohio and Tennessee), Indiana, Western (Indiana), Iowa, Kansas, California, and Oregon; there are also the small communities scattered throughout the world as already noted. The 'Hicksites' have seven yearly meetings: New York, Genesee (western New York), Philadelphia, Baltimore, Ohio, Indiana, and Illinois. The 'Wilburites' have six: New England, Canada, Ohio, Western (Indiana), Iowa, and Kansas. In 1901 the 'Orthodox' in America numbered 93,204 members; in Great Britain and Ireland, 19,955; elsewhere, 761; total, 113,920. The 'Hicksites' in 1890 had 21,992 members; the 'Wilburites' (1890), 4329, the 'Primitive' branch (1890), 232; total, for all bodies, 140,473.

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FRIENDSHIP IN FASHION. A comedy by Thomas Otway, the first work by this playwright which was not in a measure an adaptation of some other drama. It was produced at Dorset Gardens in 1678, with Betterton and Mrs. Barry in the principal parts, and published in the same year with a dedication to the Earl of Dorset. It was well received, but being revived at Drury Lane in 1750, was, on account of its indecency, hissed, in spite of the presence of Mrs. Clive in the cast.

FRIENDS OF GOD (Ger. *Gottesfreunde*). A small body of religious reformers of mystical tendencies, which originated in the fourteenth century, and labored for the reformation of the Church and society, continuing their adherence to the former. The name was derived from John xv. 15. Tauler (q.v.), the great Dominican mystic of Strassburg, and Heinrich Suso (q.v.) were of the brotherhood, and Meister Eckhart (q.v.) sympathized with it, although probably not belonging to it. It also included many Dominican nuns. The brotherhood is heard of in Basel, Strassburg, and Cologne, but probably had members elsewhere. Sympathizing to some extent with the Brothers of the Free Spirit, they nevertheless avoided the fanaticism ascribed to that body. (See **BROTHERS AND SISTERS OF THE FREE SPIRIT**.) Consult Jundt, *Les amis de Dieu au quatorzième siècle* (Paris, 1879).

FRIENDS OF THE PEOPLE. An English society founded in 1792 by Sheridan and Grey

for the purpose of promoting Parliamentary reform. Among its members were Lord John Russell and Lord Edward Fitzgerald. It was opposed by Fox and Pitt. The reform bills brought forward by Grey in 1792, 1793, and 1797 received scarcely any support. In fact, during the struggle with Napoleon the times were not favorable to any constitutional change; and so the association languished, serving mainly as a school in which were trained the great leaders who forty years later saw its original purpose accomplished in the Reform Bill of 1832.

FRIENDS OF THE TEMPLE (Ger. *Tempelgesellschaft, Tempelverein, Jerusalemfreunde*). A German sect, called also the Temple Society, and Hoffmannites, who, accepting the Scriptures in full, expect the fulfillment of all the prophecies, and believe it the duty of Christ's disciples to labor to promote that end, as Christ Himself came to do. The first step is to gather the people of God in Palestine, and with this idea, spiritual communities called Temples are instituted in different countries, to assist in the construction of the Temple in the Holy Land. The society originated in Württemberg toward the middle of the nineteenth century, under the lead of the Rev. Christopher Hoffmann. In 1868 a colony was established at Jaffa, the following year one at Haifa, and two others have been added, one at Saron, near Jaffa, and one at Jerusalem. These colonies number about 1200 members, are prosperous, and have done much for the improvement of the country. The doctrines of the Friends of the Temple have not been formulated into a creed. The spiritual development of the members is a matter to which careful attention is given. The rite of baptism and the Lord's Supper are observed, but are not under definite regulation, individual convictions being allowed to prevail in the choice of the method. Consult: Hoffmann, *Occident und Orient* (Stuttgart, 1875), and *Mein Weg nach Jerusalem* (ib., 1881-85).

FRIES, frès, ADRIAEN DE. See **VRIES**.

FRIES, BERNHARD (1820-79). A German landscape painter, born at Heidelberg. He studied at Karlsruhe, and at Munich under Cornelius; traveled in France and Austria, and remained eight years in Italy. His best works are the forty Italian views now at Munich. They are well conceived and carefully painted. His brother ERNST (1801-33) was born at Heidelberg. He was a pupil of K. Kuntz at Karlsruhe, and afterwards studied in Munich and in Italy. Despite his short life, Fries left some excellent pictures, such as "A View of Tivoli," "Sorrento and the House of Tasso," "The Waterfall of Liris at Isola di Sora," "The Castle of Massa," and "A View of Heidelberg." The works show a sincere feeling for nature.

FRIES, ELIAS MAGNUS (1794-1878). An eminent Swedish botanist. He was born in the parish of Femsjö, and studied at the University of Lund, where he became demonstrator in botany in 1828. In 1834 he went to the University of Upsala as professor of economic science, to which chair, after the death of Professor Wahlenberg, in 1851, was united the chair of botany. In the latter year he was also appointed director of the Upsala Botanic Garden, and in 1859 he retired from active work. Fries made important contribu-

tions to all departments of systematic botany, but especially to the knowledge of lichens, fungi, and mosses, upon which groups of plants he wrote many important works. Some of his publications are: *Systema Mycologicum* (3 vols., 1820-32); *Elenchus Fungorum* (2 vols., 1825); *Lichenographia Europæa Reformata* (1831); *Flora Scanica* (1835); *Sind die Naturwissenschaften ein Bildungsmittel?* (1844); *Summa Vegetabilium Scandinaviæ* (2 vols., 1846-49); *Novæ Symbolæ Mycologicæ* (1851); *Monographia Hymenomycetum Suecicæ* (2 vols., 1857-63); *Epicrisis Generum Hieraciorum* (1862); *Sveriges ätliga och giftiga svampar, Fungi Esculenti et venenati Scandinaviæ* (1862-69), with 93 colored plates; *Botaniska utflygter*, three volumes of collected short papers (1843-64).

FRIES, JAKOB FRIEDRICH (1773-1843). A German philosopher, born at Barby, Saxony. He studied there and in the universities of Leipzig and Jena, and became a lecturer in philosophy at the latter in 1801. From 1805 to 1816 he was professor of philosophy and elementary mathematics at Heidelberg, and from 1816 until his death professor of theoretical philosophy at Jena. His chief work is the *Neue Kritik der Vernunft* (3 vols., 1807), an attempt to find a new basis for the critical philosophy of Kant. His method is psychological. He holds that a knowledge of the *a priori* cognition of Kant is to be attained only by the *a posteriori* process of subjective experience. Hence, the *a priori* element, inasmuch as it is discoverable only by subjective experience, is not, as Kant contends, transcendental to all experience. Therefore, philosophy finds its ultimate foundation in subjective knowledge, and its true exposition through psychological analysis. Other differences from the Kantian teaching are also encountered in Fries, whose work, though ingenious, may be said to contribute little to the progress of speculation.

FRIES, JOHN (c.1764-1825). The leader of the so-called 'Fries Rebellion' in Pennsylvania in 1799. He was the son of a Pennsylvania farmer, and was successively a cooper's apprentice, a soldier (during the Whisky Insurrection), and an auctioneer. In July, 1798, Congress voted a direct tax of \$2,000,000, \$237,000 of which was fixed upon, in January, 1799, as Pennsylvania's quota. Soon afterwards Federal officers began to make the assessments. In Pennsylvania the tax fell chiefly on houses and lands, the value of the former being determined by the number and size of the windows. Among the Germans in the counties of Montgomery, Lehigh, Bucks, and Berks, a regular opposition, under the leadership of Fries, was organized to the assessment of this 'window tax.' This led to open conflict with the Federal officers, and at Bethlehem, on March 7th, a considerable force of disaffected farmers under Fries compelled the United States marshal to liberate thirty prisoners who had been arrested for opposing the law. Finally the militia was called out by President Adams, and many of the rioters, including Fries, were captured and taken to Philadelphia. Here Fries was twice tried for treason, and was each time found guilty and sentenced to death, but was eventually (April, 1800) pardoned by President Adams, who, at about the same time, issued a general amnesty

to all who had been concerned in the uprising. Afterwards Fries settled in Philadelphia, and acquired a considerable fortune in the tinware trade. Consult Davis, *The Fries Rebellion* (Doylestown, Pa., 1899); and, for an account of the trial, *Das erste und zweite Verhör von John Fries* (Allentown, Pa., 1839).

FRIESE, RICHARD (1854-). A German animal and landscape painter, born at Gumbinnen, East Prussia. He studied at the Academy in Berlin, where, after traveling in the East, in Norway, and as far as the polar regions, he rapidly acquired his present reputation as one of the best animal painters in Germany, especially noted for his vivid delineations of the lion's life in the desert, and also of the native deer world in the German forest. The distinctive conception and tone of the landscape portion in his pictures deserve especial comment. He was awarded a gold medal in 1886, and elected a member of the Berlin Academy in 1892. His most noteworthy productions include: "Lions Surprising Caravan's Camp" (1884), Dresden Gallery; "Elks on Field of Battle" (1890), National Gallery, Berlin; and "In the Bredszell Moor" (1895), Königsberg Museum.

FRIESEN, frēzen, HERMANN, Baron (1802-82). A German Shakespearean scholar. He was educated at Leipzig and Göttingen, and occupied several positions at the Court of Saxony. He became known for his *Briefe über Shakespeares Hamlet* (1864), and *Shakespeare-Studien* (1874-76). He also made valuable contributions to the *Jahrbuch* of the German Shakespeare Society.

FRIESEN, KARL FRIEDRICH (1785-1814). A German patriot, and one of the principal promoters of gymnastics in Germany. He was born at Magdeburg. He studied at the Academy of Architecture, Berlin, collaborated on the great atlas of Mexico edited by Humboldt, and from 1810 was an instructor in the Plamann Institute. In 1810-12 he rendered important services to Jahn in the establishment of German gymnastics. Upon the outbreak of the German War of Liberation, in 1813, he assisted in organizing the famous volunteer corps of Major von Lützow, whose adjutant he became. After the dispersion of the corps by Napoleon at Rheims, he was captured and shot by the French at La Lobbe, Ardennes, March 15, 1814. In 1843 his body was buried with solemnity in the military cemetery at Berlin. He has frequently been celebrated by German writers, in particular by E. M. Arndt in "Es thront am Elbebrande." Consult Schiele, *Friedrich Friesen Eine Lebensbeschreibung* (Berlin, 1875).

FRIESEN, RICHARD, Freiherr von (1808-84). A statesman of Saxony. He was born at Thürmsdorf, Saxony, was educated at Göttingen and Leipzig, entered the civil service of Saxony, and rose to be Minister of the Interior from 1849 to 1852. In 1858 he became Minister of Finance, and in 1867 of Foreign Affairs also. He was appointed in 1870 a commissioner to arrange in Versailles with the South German States treaties looking to the unification of Germany. From 1871 until his retirement in 1876 he was president of the Ministry. Consult his *Erinnerungen aus meinem Leben* (Dresden, 1880).

FRIESIAN, or **HOLSTEIN-FRIESIAN CATTLE**. See **DAIRY CATTLE**, under **CATTLE**.

FRIESLAND, or **VRIESLAND**, frēz'land (Lat. *Frisia*). A northwestern province of the Netherlands, bounded by the North Sea, Zuyder-Zee, and the provinces of Groningen, Drenthe, and Overijssel (Map: Netherlands, D 1). Area, 1282 square miles. The land is flat, and in some parts below the level of the sea, against the incursions of which it is protected by numerous dikes and sluices. Streams are few, but there are numerous canals and lakes abounding in fish. About 60 per cent. of the area being composed of meadows and heath, Friesland is better adapted to pastoral than purely agricultural industries. It breeds excellent horses and other domestic animals, which, with dairy products, are the chief exports. The manufacturing industries are comparatively insignificant. The capital is Leeuwarden (q.v.). The West Frisian Islands form a part of the province. Population, in 1899, 340,262.

FRIETCH'IE, BARBARA. See **BARBARA FRIETCHIE**.

FRIEZE (OF. *frise*, *frize*, Fr. *frise*, Olt. *frigio*, *friso*, *fregio*, It. *fregio*; probably from ML. *phrygium*, *fristum*, embroidered work, from Lat. *Phrygius*, Gk. *Φρύγιος*, *Phrygius*, Phrygian, from *Φρυξ*, *Phryx*, Phrygian; otherwise connected with OF. *friser*, *frizer*, Fr. *friser*, OFries. *frisle*, *fresle*, hair of the head). In classical architecture, the central division of the entablature (q.v.). In the Doric style the frieze is cut into sections by triglyphs (q.v.), the interspaces being called metopes (q.v.). In other orders the frieze is continuous and usually plain, being ornamented only in the Roman period and in the Corinthian order by a scroll-work decoration. It is also called (by Vitruvius) the zophorus, from its being frequently ornamented with sculpture. From the same cause the term frieze is sometimes applied to any enriched horizontal band in any style of architecture.

It is then not necessarily a part of an entablature, and the enrichment may be that of painting, mosaic, carving, inlay, or any other form of decoration. Richly sculptured friezes are those of the Choragic monument of Lysicrates, the mausoleum of Halicarnassus, the Xanthus tomb, the Treasury building at Delphi, the temple of Nike Apteros at Athens, that of the temple of Apollo at Phigaleia, of the Pergamon altar, and the temple; but the masterpiece of all Greek friezes is that of the Parthenon.

FRIEZE, HENRY SIMMONS (1817-89). An American scholar and writer. He was born in Boston, Mass., September 15, 1817. After 1830 he became a clerk and organizer. He was graduated at Brown University in 1841, and until 1845 was instructor in the university. From 1845 to 1854 he was instructor in the grammar school of the university. He then left Brown to accept the professorship of Latin at the University of Michigan, a position which he held until his death, in December, 1889. From 1869 to 1871 he was acting president of the university, during which period most of the academic privileges were thrown open to women. Frieze devised a system of inspection which established an official connection between the university and the high schools of the State. In the year 1880-81 he was again acting president. The degree of LL.D.

was conferred upon him by Chicago University and Kalamazoo College in 1870, by Brown in 1882, and the University of Michigan, 1885. He edited Vergil's *Æneid* and books x. and xii. of the *Institutes* of Quintilian, delivered and published addresses on *Ancient and Modern Education* and *Art Museums*, and presented valuable reports to the Michigan State Board of Regents. His last work was *The Story of Giovanni Dupré* (1886).

FRIGATE (from OF. *fregate*; possibly from Lat. *fabricata*, sc. *navis*, ship, p.p. of *fabricari*, to build, from *fabrica*, workshop, from *faber*, artisan). A war-ship of a type which has not been built for more than half a century. The term was used in the Mediterranean in the fourteenth and fifteenth centuries—and perhaps for many centuries before—to designate a narrow, fast-sailing vessel, fitted also to be propelled by oars, and having holes in the sides for the passage of the latter resembling gun-ports. These vessels were small, and were used for ordinary purposes of traffic and not for war. Their shape and speed caused the model to be followed for larger craft adapted for heavy weather in the open sea. In the sixteenth century the term was very generally applied to merchant ships in all the countries of Western Europe. Toward the close of the century certain of these merchant frigates were hired for service in the English Navy; but they appear to have been quite small craft. The first frigate built in England was the *Constant Warwick*, built at Ratcliffe by Peter Pett the elder, as a privateer for the Earl of Warwick, and afterwards purchased by the Government. The model was taken from a French frigate, according to the Earl's son; but Pett, or his friends, claimed that he was the inventor of the frigate. The *Constant Warwick* carried 26 guns as a privateer; but the battery was gradually increased to 42 guns in 1677. The distinguishing characteristics of frigates grew to be speed and handiness combined with moderate size. The type began to crystallize during the seventeenth century, and soon after the middle of the eighteenth it was well established. Frigates were then rated as forty-fours, thirty-eights, thirty-sixes, thirty-twos, twenty-eights, and twenty-fours, according to the number of guns carried. Ships carrying less than 32 guns were rarely frigate-built, and it was common for frigates to carry several guns more than implied in their rating, particularly after the introduction of carronades (q.v.). At the beginning of the nineteenth century a frigate was a vessel carrying guns on one covered deck and on an uncovered deck above this. If these were all long guns the gun-deck (lower) battery consisted of 26 to 32 long 18-pounders or 12-pounders, and the spar-deck battery of six to twelve 6, 9, or 12 pounders. The rig was that of a ship, three masts, square-rigged on all. The tonnage—a rather uncertain measure of size—of the British frigates varied between 500 and 1200; some of the United States Navy were larger. (See **CONSTITUTION**; also, section on Navy, in article **UNITED STATES**.) After the application of steam to war-vessels, the term frigate steadily lost significance, and is now no longer used, except in some European navies, where *captain of frigate* is a title of rank of naval officers answering to that of commander in the United States Navy.

FRIGATE-BIRD (so called from their attacks on other sea-birds), or **MAN-OF-WAR HAWK**. A sea-bird (*Fregata aquila*) of the order *Steganopodes*, related to the pelicans, and hence sometimes called 'frigate pelican.' It is a large bird with black plumage, sometimes measuring 10 feet from tip to tip of its extended wings, and is capable of very powerful and rapid flight. It



FRIGATE-BIRDS.

In the foreground is a male with distended pouch.

inhabits the intertropical coasts, both of the Atlantic and Pacific oceans, often flying out far to sea, but most of the time remaining near shore. Its aerial evolutions are extremely graceful, and it soars to a great elevation. It is said never to dive for its prey, but to seize fishes only when they appear at the surface or above it, and flying fishes constitute no small part of its food. It also pursues gulls and terns, and eats the fish which it forces them to disgorge. The feet are very small, but the bill is five inches long and strongly hooked at the tip. A closely allied species (*Fregata minor*) is found in the Pacific and Indian oceans, and the two comprise the whole genus, which is the only one in the family *Fregatidae*. These birds breed in companies on the ledges of sea-cliffs, on trees near shore, or on the ground of oceanic islets, making a very rude nest and laying a single white egg. In the breeding season the gular pouch of the male becomes a vivid scarlet and is greatly distended, so that these birds form very striking objects as they roost upon the ground or wheel about in the throng of the colonies. The interior of the pouch is in communication with the air-sacs of the neck, and is filled or emptied (slowly) through the bronchi. When full it is a semi-transparent balloon, and reaches forward as far as the end of the beak, and downward so as to completely hide the breast. When empty it retracts to invisibility between the rami of the lower mandible.

Consult: Bennett, *Gatherings of a Naturalist in Australia* (London, 1860); Mosley, *A Naturalist on the Challenger* (London, 1879); Buller, *Birds of New Zealand* (2d ed., London, 1888);

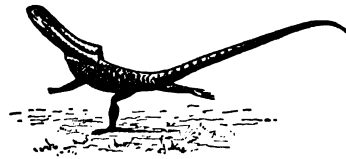
Forbes, *Wanderings in the Eastern Archipelago* (New York, 1885); Leiter, account of nesting of frigate-birds on Phenix Island, South Pacific Ocean, in *Proceedings of the Zoological Society of London* (London, 1891). See **TROPIC-BIRD**, and also **PLATE OF FISHING BIRDS**.

FRIGATE MACKEREL. A species of mackerel (*Auzis thazard*) abounding in all warm seas, sometimes in immense schools, but of little value. See **MACKEREL**.

FRIGGA, frig'a. See **FREYJA** AND **FRIGGA**.

FRILL-BACK. A domestic pigeon of an East Indian breed, whose feathers are wholly turned forward. The beak is very short.

FRILLED LIZARD. A large agamoid lizard (*Chalmydosaurus Kingii*) of the tropical parts of Australia, remarkable for its erectile ruff and for its running on two legs only. Its habits are sylvan, and its chief resort is the trunk or lower limbs of a tree. It subsists on beetles almost exclusively, all captured alive and in daylight. At night it rests clinging to the bark in an upright position. Its ordinary attitude is with the hind legs spread and flexed, letting the vent and tail rest upon the ground, while the fore part of the body, with the head uplifted, is supported high upon the stiffened forearms. When this lizard runs, however, it holds the fore part of the body clear of the ground and goes upon the hind legs alone, after the manner of a bird. This feature, and its bearing upon the animal's ancient avine and lacertilian relationships, are discussed by Professor Saville-Kent in the *Proceedings of the Zoological Society of London* for 1895, pp. 712 to 717. The same specialist describes, from a study of captive examples, the skin membrane about the neck as a denticulated frill, which in old lizards may measure eight or



A FRILLED LIZARD, RUNNING.

nine inches in diameter. It may be erected or depressed at will; but as slender processes of the hyoid bone extend into it, the membrane cannot be expanded unless the mouth is open, nor can the opening of the jaws fail to lift the bill, which is otherwise folded inconspicuously upon the neck. (See **LIZARD**.) It is dun-colored on the outside, like the rest of the body; but its inside, brought to view when erected, is brilliant with red and yellow mottlings, as also are the parts of the head otherwise concealed. Its function, evidently, is to act as a 'scare' organ. The sudden expansion of this gaudy disk in the face of an enemy, with the wide-open, sharply hissing mouth in the centre, followed, as a rule, by an instantaneous rush forward, is calculated to terrify the foe completely. In addition to this harmless demonstration, the long, whip-like tail is vigorously lashed from side to side, and able to inflict sharp blows likely to be both disconcerting and painful. Compare **JEW LIZARD**, and consult Saville-Kent, *The Naturalist in Australia* (London, 1897).

FRIMAIRE, frémâr' (Fr., sleety). The third month in the French Republican Calendar of 1793. It began on November 21st in years 1 to 3 and 5 to 7; on November 22d in years 4, 8 to 11, 13 and 14; and on November 23d in year 12.

FRIMONT, frémôn', JOHANN MARIA, Count, Prince of Androdoco (1759-1831). An Austrian general, born at Finstingen, Lorraine. He studied at the Collège at Pont-à-Mousson, entered the Austrian Army in 1776, fought against Napoleon, and by 1812 was commanding a cavalry division under Prince Schwarzenberg. In 1815, with the rank of general of cavalry, he was in command of the Austrian forces in Northern Italy, and subsequently of the army of occupation. He was appointed in 1821 to the chief command of the army sent to restore order at Naples and suppress the Carbonari. On March 24th he entered the city in triumph. In 1831 he became president of the Council of War.

FRINGES (dialectic Fr. *frinche*, ML. *fringia*, OF. Fr. *frange*; probably from Lat. *fibria*, border, fringe). In optics, the alternate bands of light and dark, due to the interference of waves of light, which are produced when a beam passes the sharp edge of a screen, or is transmitted through a narrow slit or hole, or bi-prism, or by reflection from a Fresnel mirror, are called fringes. See DIFFRACTION; INTERFERENCE; LIGHT.



FRINGE-TREE.

FRINGES. In the English Bible, the translation of the Hebrew *gedilim* in Deut. xxii. 12, and of *sisith* in Num. xv. 38. The marginal reading of the Revised Version, 'twisted threads' and 'tassels,' is probably better. In the passage in Deuteronomy the Hebrews are commanded to place fringes upon the four corners of their robes; in Numbers, in a later passage, the description is more detailed, and the reason is assigned "to remember all the commandments of the Lord." The injunction was much elaborated by the rabbis, and made a matter of the first importance in Judaism (cf. Matt. xxiii. 5). Originally the garment to which the fringes were attached was the outer one; passages in the Gospels in which it is stated that the healing power of Jesus was experienced if the hem or border of His garment were touched doubtless refer to the fringes or tassel (Matt. ix. 20; xiv. 36; Mark vi. 56; Luke viii. 44). In the course of time, because of persecution, the fringes came to be concealed, and are now put by orthodox Jews on a separate garment worn under the outer, reaching only to the chest, and called the smaller *tallith*, to distinguish it from the larger *tallith*, which also has fringes and is worn only during the recital of the prayers. In form it is a modern survival of the ancient dress of the Jews. The wearing of fringes is doubtless based on some ancient custom of a religious character; possibly they were regarded as amulets. Consult: Robertson Smith, *Religion of the Semites* (London, 1894); Nowack, *Hebräische Archäologie* (Freiburg, 1894).

FRINGE-TREE (*Chionanthus*). A genus of plants of the order Oleaceæ, consisting of small trees or large shrubs, natives of America and China. The common fringe-tree, or snowflower (*Chionanthus virginica*), is found in the United States from Pennsylvania and Delaware to the Gulf of Mexico, and west to Texas. It sometimes attains the height of 20 or 30 feet, but is rarely

more than 8 or 10 feet high; has opposite oval leaves 6 or 7 inches long, and very numerous snow-white flowers in panicle racemes. The

limb of the corolla is divided into four, sometimes five or six, linear segments an inch or more long, whence the name fringe-tree. The fruit is an oval drupe. The tree is frequently cultivated as an ornamental plant.

FRINGILLIDÆ (Neo-Lat. nom. pl., from Lat. *fringilla*, a sort of small bird, probably the chaffinch). A family of typical passerine birds, having a conical or nearly conical bill, sometimes short and thick, sometimes comparatively slender and elongated, sometimes convex above, below, or at the sides, the commissure—line of junction of the mandibles—straight. The neck is short, and neither the tail nor the wings are long. The Fringillidæ are all small birds, and feed chiefly on seeds, but to some extent also on insects. The family is an extremely numerous one, and is distributed over all parts of the world. It is represented in America by finches, sparrows, grosbeaks, crossbills, etc., elsewhere described, and has by some systemists been placed at the head of the list of all birds, being regarded as the most highly organized group. (See FINCH.) Typical forms are illustrated in the plates FAMILIAR SPARROWS; BUNTINGS AND GROSBEAKS; CAGE-BIRDS.

FRISCH, frish, JOHANN LEONHARD (1666-1743). A German philologist and lexicographer, born at Sulzbach. He studied at Altdorf, Jena, and Strassburg, was for a short time a pastor at Neusohl, Hungary, and after extensive travels settled at Berlin, where in 1727 he was appointed rector of the Gymnasium zum Grauen Kloster. In 1706 he became a member of the Royal Scientific Society, and in 1731 director of the historical-philological division. Best known and most important of his works is the *Deutsch-lateinisches Wörterbuch* (1741), the result of thirty years' labor, and the first to be prepared on scientific principles.

FRISCHES HAFF, frish'ez häf (LG., Fresh-water Bay). A large lagoon on the northern coast of Prussia, southeast of the Gulf of Danzig (Map: Prussia, H 1). It is rather less than 60 miles in length from northeast to southwest, with a breadth which varies from 2 miles to 18 miles, and an area of 330 square miles. It has a depth of from 10 to 16 feet, and was once entirely walled off from the Baltic by the Frische Nehrung, a narrow spit of land extending for about 40 miles along its northern shore. In 1510, however, the waters of the Frisches Haff broke over the Frische Nehrung, and formed the passage called the Gatt, which unites the lagoon with the Baltic. The Gatt is only from 10 to 15 feet in depth. All large vessels load and unload at Pillau, which is situated at the mouth of the Gatt, on the shore of Danzig Bay. Cargoes are conveyed to and from the ports on the Frisches Haff by means of lighters. The lagoon receives the waters of the Nogat, Pregel, Frisching, and Passarge and part of the waters of the Vistula.

FRISCHLIN, frish'lën, NIKODEMUS (1547-90). A German philologist and Latin poet, born at Balingen, Württemberg. He studied at the University of Tübingen, and became professor of history and poetry there in 1568. Through the jealousy of his colleagues and the hatred of the nobility, whom he had angered by his satiric wit, he was compelled to relinquish his chair, and in 1582 became rector of the school at Laibach in Carniola. From 1584 to 1587 he was again at Tübingen, but in 1588 became rector of a school at Brunswick. Expelled thence in 1589, as the result of a pasquinade, he wandered about for a time, and finally was imprisoned in 1590 in the Hohenurach Dungeon at Mainz. He broke his neck in an attempt to escape. He wrote in Latin some indifferent tragedies; a few comedies, of which the best is *Julius Cæsar Redivivus* (1584); and poems, including principally *De Natali Jesu Christi*, and the *Hebræis*, a hexametric chronicle of the Jewish kings. His philological study is best represented by the *Grammatica Latina* (1585). Consult Strauss, *Leben und Schriften des Dichters und Philologen Frischlin* (Frankfort, 1856).

FRIS'CO. A popular abbreviation of the name San Francisco.

FRISI, frē'zē, PAOLO (1728-84). An Italian mathematician. He was born at Milan, taught philosophy at Padua, and became, in 1756, professor of mathematics at Pisa, and in 1764 at Milan. When less than twenty-three years of age he published a remarkable *Disquisitio Mathematica* (1751), upon the physical causes which have determined the magnitude and shape of the earth. He also published: *De Atmosphæra Cælestium Corporum* (1758); *De Inæqualitate Motus Planetarum* (1760); and *Del modo di regolare i fiumi e i torrenti* (1762).

FRISIAN LANGUAGE AND LITERATURE (OFris. *Frise*, *Frese*, AS. *Frisa*, ML. *Friso*, Lat. *Frīsii*; possibly connected with OFris. *frāse*, danger, AS. *frāsan*, Goth. *fraisan*, OHG. *fraisōn*, to test). The language and literature of a branch of the Germanic family of dialects which was formerly spoken along the coast of the North Sea and on the coast islands from the Rhine to the Ems. The Frisians are first mentioned by Tacitus, who divides them into the

greater and the lesser. Their boundaries varied at different periods, however, so that the entire coast-line from the Scheldt to the Weser has at one time or another been occupied by those who spoke the Frisian language. Of all the Germanic dialects this is the one nearest akin to Anglo-Saxon, so that the two tongues are sometimes classed together as Anglo-Saxon Frisian. Thus we have Anglo-Saxon *mōna*, Old Frisian *mōna*, moon, but Old High German *māno*, Gothic *mēna*, or Anglo-Saxon *æcer*, Old Frisian *ekker*, field, acre, but Old High German *achar*, Gothic *akrs*. On the other hand, Frisian has many points of association with Dutch and Icelandic, which are not found in Anglo-Saxon, as *of*, or, *wēr*, true, while the Icelandic and Anglo-Saxon have the so-called 'breaking' of the vowels before *r*, *l* + consonants which does not occur in Frisian, e.g. Anglo-Saxon *beorh*, Icelandic *biarg*, hill, but Old Frisian, Old High German *berg*. It seems probable, on the whole, that the Anglo-Saxons once occupied the land between the Frisians and the Scandinavians, and that of the Anglo-Saxon dialects the Kentish stood nearest the Frisian (e.g. Old East Frisian *biade*, he commanded, Kentish *biade*, but West Saxon *bēode*), while next to the Kentish in this respect came the West Saxon, and finally the Northumbrian and Mercian.

Frisian is divided into numerous dialects, many of which now differ from each other to a surprising degree. Indeed, so divergent are many words in the vocabularies of the various dialects, that some of the commonest terms become unintelligible after a very short distance. It is furthermore necessary to bear in mind the strong influence exercised by Danish over the vocabularies of many dialects. By a phenomenon, somewhat unusual in language, many terms for the most familiar objects are loan-words in Frisian, being borrowed from the Danes.

Frisian may be divided first into East and West Frisian, and the former of these again into East and North Frisian. The East Frisian, using the term in this restricted sense, is subdivided into the Weser and the Ems dialects. This group has been gradually supplanted by Low German (Plattdeutsch), so that what is now often called East Frisian is, in reality, a Low German dialect. In 1890 thirty-two persons on the island of Wangeroog, and about 2000 in the Saterland of Oldenburg still spoke East Frisian. The North Frisian group, which formed the vernacular of about 2600 persons in 1885, is divided into seven dialects on the mainland and three on the islands. The dialects of the coast have been strongly influenced, not only by Low German, but also by Danish, and island dialects seem to show in addition the presence of West Saxon elements. Of Old North Frisian hardly any records exist, the oldest being a short inscription on a font of 1452 at Pelworm. Old West Frisian, on the other hand, is represented by literary remains which are relatively extensive, while the New West Frisian is that in which the bulk of modern Frisian literature is composed. The dialects of New West Frisian are not separated by such wide divergencies as the East and North groups, although they number six, since the majority of the differences are due to the operation of analogy (q.v.).

The Frisian employs the Roman alphabet, but uses *u*, *v*, and *w*, as well as *c* and *k*, almost in-

discriminately. The vowels have the Italian values, and the consonants are pronounced in general as in German, excepting that *s* is soft like the English *z*, and that *k* or *c* is frequently palatalized before *e* and *i* to *ch* or *sh* (written *sz*, *sth*, *ts*, *tz*, *tez*, or, in West Frisian, simply *s*, *z*). There is a tendency to elide *r* and *l* (*dega* beside *degar*, days; Modern Frisian *woed*, *woe*, Anglo-Saxon *woelde*, English *would*). The guttural *g* is often vocalized to *ï* (*jeld* for *geld*, payment; cf. Anglo-Saxon *geard*, English *yard*). The old pronunciation of *th*, as in English *thorn*, is still retained in some of the island dialects (West Frisian *thank*, thanks, but North Frisian *tônk*). The sound of *h* was extremely weak. The morphology of Frisian is essentially Germanic in its type. In nouns there are the three genders, two numbers, five cases, and the division into strong and weak declensions. Even in modern North Frisian the pronoun retains the dual (*wat* and *jat*, cf. Anglo-Saxon *wit* and *git*), which has been lost in all other modern Germanic languages. The verbs are strong, weak, and preterite-present, forming their past tenses, as in the other dialects of this group, either by ablaut (q.v.), or by composition with the verb signifying *to do* (e.g. Frisian infinitive *finda*, to find, preterite singular *fand*, preterite plural *fundon*, past participle *funden*, Anglo-Saxon *findan*, *fand*, *fundon*, *funden*; Frisian *hatia*, to hate, preterite *hatade*, *hatadon*, past participle *hatad*; Anglo-Saxon *hatian*, *hatade*, *hatadon*, *gehatad*; Frisian *môta*, to be obliged, present singular *môt*, present plural *môton*, preterite *môste*, Anglo-Saxon *môtan*, *môt*, *môton*, *môste*). The passive is formed like the Germanic passive generally, except in Gothic and the Scandinavian dialects, by *wesa* (Anglo-Saxon *icesan*), to be, with the past participle (e.g. Frisian *ik was funden*, Anglo-Saxon *ic wæs funden*, I was found). The syntax of Frisian follows the general type of the older Germanic languages.

FRISIAN LITERATURE. Frisian literature is, relatively speaking, extremely scanty. The oldest specimens of Frisian date no further back than the thirteenth century, although it may be shown by references to the ancient Latin chronicles that here, too, the Germanic epics had flourished at least five centuries before. These ancient epics were doubtless alliterative like the Anglo-Saxon and Icelandic poems, but beside the alliteration might be found now and then rhymed verse, as we find it for instance in Old High German in Otfrid's *Evangelienbuch*. As an example of such a verse, which also shows a trace of the older alliteration, we may quote

hē stifte and stērde treuwe und wērde

(he founded and strengthened fidelity and worth). Of this class of literature the most noteworthy is the so-called Privilege of Charlemagne, which purports to confer certain political rights on the Frisians. The production is, however, a forgery of the thirteenth century. It is written in rhythmic prose. The Rudolf-book, claiming to belong to the twelfth century, but probably written two centuries later, is a legendary account of the laws given by one Rudolf to the Frisians, who had been summoned to contribute a levy of troops for service against the Northmen. There is also a collection of 1671 verses edited under the title *Thet freske rym*, which is a translation of Low German verses, and

composed in a barbarous mixture of dialects which renders it practically useless for the study of the language. The prose literature is much more extensive and important. It begins about the eleventh century with an interlinear translation of the Psalms and with a late Chronicle. The remainder of the prose is devoted to legal topics. These law-books fall into two sections, general and local. To the general codes belong, among others, the seventeen *Keren* (petitions) and the twenty-four *Lôndriuchta* (land-rights). These were originally written in Latin and later translated into the various Frisian dialects. Besides some additions to the *Keren*, there is also the code of Upstalbôm, dating from 1323. Among the local law-books by far the most important class is formed by the Prologues and Tractates. The Prologues, as the name implies, are introductions to the codes proper, and deal with the history of the land or the dynasty, or treat of the theory and nature of law. Old sagas, too, are found in some Prologues, such as the saga of Karl and Redbad, or that of Magnus. More miscellaneous topics contained in them are descriptions of the Day of Judgment, the Creation, the grades of the priesthood, and the like. The Tractates themselves contain the legal codes. Tax-lists, formulas for taking the oath, letters, and synodical epistles (*sinuthriuchta*) are also found in the prose literature of Old Frisian.

The modern Frisian literature dates from the sixteenth century. Poetry is dead in East Friesland. In 1632 Imel Agena, of Uppant, composed a trivial poem in Alexandrines, which seems to have been a portion of a dance song. In North Friesland poetry was little better developed, although there are a few verses preserved, as well as a number of sagas current on the islands. The only important piece of North Frisian literature is J. P. Hansen's comedy *Di Gidtskals of di Sôlring Pid'ersdei* (Flensburg, 1809; 2d ed. with the addition of a story, *Di leddelk Stjûрман*, and some poems, Sonderburg, 1833). The most important of the modern Frisian literatures is the West Frisian, which has a continuous line from the sixteenth century to the present time. Between the old and new periods of this dialect there is, therefore, almost no gap, for the last example of Old West Frisian is a law of 1559, and the first specimen of the New is a comic dialogue of 1609, *Een tsamensprekinghe van tucce boersche Personen, Wouter en Tialle*. Early in the seventeenth century arose one of the greatest names in Frisian literature, that of Gysbert Japiks (1603-66). He was a true poet, turning especially toward peasant life, rich, too, in love poetry, and in the dialogue with which the modern period had begun. He was influenced by Dutch and classical models, but was, nevertheless, unaffected and unpedantic. In his last years, however, he lost his early simplicity. His imitator, Jan Althuysen (1715-63), like Japiks, made a translation of fifty-two Psalms and composed in addition many occasional poems. From the time of Althuysen till the present, no great literary name has arisen among the Frisians. Many brief poems, epithalamia, and the like, have been written, but only comedy deserves any special mention. Full of wit, and turning on the difference between the country and city, these plays portray excellently the peasant life. Most

noteworthy are Eelke Meinderts's *It libben fen Aagtje Iysbrants, of dy frieske boerinne* (1779); *De tankbrê boerzoon* (1778); *De reys fen Maicke Jukkelis* (1778); and *Het jonge lieues boosh* (1780).

Of the later Frisian writers, the most noteworthy are the Halbertsma brothers, Joost Hiddes (1782-1869), and Eeltje (1797-1858). The latter was a poet of talent, as is evident from his *Lapekoer fen Gabe Seroar* (1822), and his *Rimen en Teltsjes* (1868). Among other poets may be mentioned P. C. Salverda (*Ijljycke frieske Rymckes*, 1824); Rinse Posthumus, who wrote *Prieuwecke fen friesche Rymmelerije* (1824), and translated several of Shakespeare's plays, such as *Julius Cæsar* and *The Merchant of Venice*. J. G. van Blom (1796-1871) was a poet of the people, and J. F. van der Wey-Rutgers, H. G. van der Veen, and C. Wielsma wrote of child-life. Waling Dykstra (1821—) is the most prolific of contemporary Frisian authors, while the most elegant is probably Pieter Jelles Troelstra (1860—), who is known not only as a lyric poet, but, also as one of the editors of the Frisian monthly *For Hûs en Hiem*.

BIBLIOGRAPHY. The most complete account of the Frisian language and literature is found in Siebs, *Geschichte der friesischen Sprache*, in Paul's *Grundriss der germanischen Philologie*, vol. i. (2d ed., Strassburg, 1901), and *Geschichte der friesischen Literatur*, vol. ii. (ib., 1893), where references to all the literature on the subject are collected. Consult also: Bendsen, *Die nordfriesische Sprache nach der Mohringer Mundart* (Leyden, 1860); Johansen, *Die nordfriesische Sprache nach der Föhringer und Amrumer Mundart* (Kiel, 1862); Winkler, *Algemeen nederduitsch en friesch Dialecticon* (The Hague, 1874); Cummins, *Grammar of the Old Frisian Language* (London, 1887); Colmjon, *Beknopte friesche Spraakkunst vor den tegenwoordigen Tijd* (2d ed., Joure, 1889); Siebs, *Zur Geschichte der englisch-friesischen Sprache* (Halle, 1889); van Helten, *Altostfriesische Grammatik* (Leeuwarden, 1890); Outzen, *Glossarium der nordfriesischen Sprache* (Copenhagen, 1837); Richthofen, *Altfriesisches Wörterbuch* (Göttingen, 1840); Sturenburg, *Ostfriesisches Wörterbuch* (Aurich, 1862); ten Doornkaat Kooman, *Wörterbuch der ostfriesischen Sprache, etymologisch bearbeitet* (3 vols., Norden, 1879-84); Dykstra and Hettema, *Friesch Woordenboek* (Leeuwarden, 1896 et seq.); Richthofen, *Friesische Rechtsquellen* (Berlin, 1840); Hettema, *Oude friesche Wetten* (Leeuwarden, 1845-51); id., *Untersuchungen über friesische Rechtsgeschichte* (Berlin, 1880-86); id., *Bloemlezing uit oud-, middel- en nieuwfriesche Geschriften* (Leyden, 1887 et seq.); Siebs, *Sylter Lustspiele* (Greifswald, 1898).

FRIT (Fr. *fritte*, from It. *fritta*, frit, from *friggere*, Lat. *frigere*, to parch). An active greenish-black fly (*Oscinis frit*) of the size of a large flea, which does great injury to barley crops in the north of Europe. It lays its eggs in the flowers, and its larvæ live on the young grains. The family is represented in America by the species *Oscinis variabilis* and other minute 'grass-stem flies' of the genera *Meromyza*, *Chlorops*, etc., which damage various crops. In the Southern States they swarm in clouds at certain seasons and get into the eyes of animals and men, and

to them has been attributed the spread of the disease pink-eye (q.v.).

FRITH, or **FRYTH**, JOHN (1503-33). An English Protestant martyr. He was born at Westerham, in Kent, and educated at Eton and Cambridge, where Gardiner, subsequently Bishop of Winchester, was his tutor. Immediately after taking his bachelor's degree (1525), invited by Wolsey, he transferred his residence to the newly founded Cardinal College (now Christ's Church), Oxford. He made the acquaintance of Tyndal, and assisted him in his translation of the New Testament. His zeal in the cause of the Reformation led to his imprisonment at Oxford for some months. At the instance of Wolsey he was released (1528), and fled to the Continent, where he resided chiefly at the newly founded Protestant University of Marburg, and was again associated with Tyndal in literary labors. At Marburg he became acquainted with several scholars and Reformers of note, particularly with Patrick Hamilton (q.v.). His first publication was a translation of Hamilton's *Places*, made shortly after the martyrdom of the author, and soon afterwards appeared *A Pistle to the Christen Reader*, under the pseudonym 'Richard Brightwell' (1529), and *A Disputacion of Purgatorye*, a treatise against Rastell, Sir Thomas More, and Fisher, Bishop of Rochester (1531). In 1532 he ventured back to England. Warrants for his arrest were almost immediately issued, at the instance of More, then Lord Chancellor. After evading pursuit for some weeks, he fell into the hands of the authorities as he was on the point of making his escape to Flanders. The rigor of his imprisonment in the Tower was abated when Sir Thomas Audley succeeded to the chancellorship, and it was understood that both Cromwell and Cranmer were disposed to leniency. But the treacherous circulation of a manuscript, *Lytle Treatise on the Sacraments*, which Frith had written for the information of a friend, with no view to publication, further excited the hostility of his enemies. He was tried and found guilty of denying that the doctrines of purgatory and transubstantiation were necessary articles of faith. June 23, 1533, he was handed over to the secular arm, and was burnt at Smithfield, London, July 4. During his captivity he wrote a controversial work on the eucharist, and several tracts. Frith was the first to maintain the doctrine regarding the sacrament of Christ's body and blood which ultimately came to be incorporated in the English communion office. Twenty-three years after his death as a martyr, Cranmer, who had been one of his judges, went to the stake for the same belief, and three years later it had become the publicly professed faith of the English nation. Frith's works were published by Foxe (London, 1573), and there was another edition in 1631.

FRITH, WALTER. An English dramatic author and critic; the son of the Royal Academician W. Powell Frith. He was born in London, was educated at Harrow and Cambridge, then studied law, and became a barrister in 1880. Among his literary works, besides other publications, are a number of plays which have been produced in London and elsewhere; the list includes: *Brittany Folk* (1889); *The Verger* (1892); *Her Advocate* (1895); *Not Wisely but Too Well* (played by the Kendals in London in

1898); and *The Man of Forty*, his best-known piece, brought out by George Alexander in March, 1900, and reproduced in New York in November of the same year, at Daly's Theatre.

FRITH, WILLIAM POWELL (1819—). An English figure and genre painter. He was born near Ripon, Yorkshire, January 9, 1819. He was a pupil of Sass's noted art school in Bloomsbury, and a student of the Royal Academy. In 1840 he exhibited his "Malvolio Before the Countess Olivia," which attracted much public attention. His "Village Pastor," painted in 1845, made him an associate member of the Academy. For some time he continued to paint in a similar vein, producing his pictures, "The Parting Interview of Leicester and the Countess Any," "The Coming of Age," "Pope Making Love to Lady Mary Wortley Montagu," etc. But it was not until Frith was elected a Royal Academician in 1853 that he took on a new manner in portraying the humorous aspect of an English crowd. His "Life at the Seaside, Ramsgate," was a lively interpretation of a cockney gathering when abroad for a holiday. It was purchased by Queen Victoria. Frith's "Derby Day," painted in 1858, and said to be the picture of the year, in popularity at least, was a vivid representation of this English carnival, and executed with most admirable finish. Frith painted the "Marriage of the Prince of Wales" (1865), a commission from Queen Victoria. Among his later works are the "Railway Station," "The Road to Ruin" (1878), and "Private View of the Royal Academy" (1881). Consult: Frith, *My Autobiography and Reminiscences* (London, 1887); id., *Further Reminiscences* (ib., 1888); Muther, *History of Modern Painting* (New York, 1896).

FRITHJOF'S SAGA, frēt'yófs sǫ'gá. An ancient Icelandic myth. It was probably first written down at the end of the thirteenth or in the beginning of the fourteenth century, and records the life and adventures of the hero Frithjof (properly *Fridhthjófr*, 'peace-destroyer'), who loved the beautiful Ingeborg, the daughter of a petty king of Norway. After being rejected by the brothers of Ingeborg, and having committed various acts of revenge on his enemies, he comes to the Court of the old King, Hring, to whom Ingeborg has been married, and is received with kindness. At the death of her husband, Ingeborg is married to her lover, who acquires with her hand the dominions of Hring, over which he rules prosperously to the end of his days. Frithjof is supposed to have lived in the eighth century; but some writers assign to him a much earlier period. This saga was included by Björner in his collection *Nordiska Kämpadater* (Stockholm, 1737); and by Rafn in his *Fornaldar Sögur Nordhrlanda* (Copenhagen, 1829). Attention has of late years been more especially drawn to this ancient saga, which is, in fact, merely one of a number of similar mythical narratives, in consequence of the Swedish poet Tegnér (q.v.) having selected it for the groundwork of a poem ("Frithjof's Saga"), which was published in its complete form in 1825, and at once became the most popular poem that had ever appeared in Sweden, and raised its author to the height of his reputation. Tegnér has been justly blamed for giving to his hero qualities that are at utter variance with the conditions under which he lived. While a certain

amount of idealization was necessary in order to adapt the story to the demands of modern taste, the poet was not justified in making a sentimental troubadour out of a Norse viking. But in spite of these striking faults the poem possesses lyrical beauties that amply insure it a permanent place in Swedish literature. The "Frithjof's Saga" of Tegnér has been translated into most of the European languages; among the six or seven English translations, we may instance those by Latham (London, 1838) and Stephens (ib., 1841).

FRITIGERN, frít'gèrn, or **FRIDIGERN**. A Visigothic chieftain. When, in 376, the Visigoths were crowded from Dacia by the inroads of the victorious Huns, he was permitted by Valens, Emperor of the East, to transport his band, which nominally, at least, was Christian, across the Danube, and to settle it in Mœsia. Quarrels ensued between the immigrants and the Roman officials, and culminated in the battle of Adrianople (August 9, 378). Fritigern, in principal command of the Visigoths, there destroyed fully two-thirds of Valens's army, thus inflicting a defeat, which, for actual loss on the field, was equaled in Roman annals only by the disaster at Cannæ (B.C. 216). Valens himself was killed and his body was never recovered. Fritigern's leadership for a brief time maintained Visigothic unity, which was dissolved immediately after his death.

FRITILLARY (from Lat. *fritillus*, dice-box, from the form of the perianth), *Fritillaria*. A genus of bulbous-rooted plants of the order Liliaceæ, natives of Europe and other temperate regions of the Northern Hemisphere. The drooping perianth, which is bell-shaped, has six distinct segments, each with a conspicuous honey-pore (nectary) at the base. About forty species, some beautiful, are known. One species, the common fritillary, or snake's-head (*Fritillaria meleagris*), a native of Great Britain, blooms in April and May in meadows and pastures in the east and south of England. The stem, about a foot high, bears several linear leaves, and, in general, only one flesh-colored, dark-spotted flower. Many varieties, including the crown imperial (*Fritillaria Imperialis*), a native of Persia and the north of India, are in cultivation. Among the indigenous American species, which have scaly bulbs and are confined to the Pacific coast, the best known are *Fritillaria pudica*, *Fritillaria recurva*, and *Fritillaria camtschatcensis*, sometimes called black lily, which occurs from California to Alaska and in Siberia. In Alaska the bulbs were formerly gathered, dried, and, to a considerable extent, eaten. They are surrounded by many small white bulblets of the size and shape of a grain of popcorn, and are sometimes called wild rice. They have been frequently taken from the crops of birds at considerable distances from where they were grown.

FRITILLARY (Neo-Lat. *fritillaria*, nom. pl., from Lat. *fritillus*, dice-box), or **SILVERSPOT**. A nymphaline butterfly, of a group mostly the genus *Argynnis*, with fulvous and black checkered wings. The hind wing is often marked with a row of silvery eye-spots. There are more than fifty species in the United States, whose larvae feed at night on violets. The great spangled (*Argynnis Cybele*) and the variegated fritillary (*Euptoieta claudia*) are two common North American representatives.

FRITSCH, frich, ANTON JOHANN. See FRIC.

FRITSCH, GUSTAV THEODOR (1838—). A German scientist and traveler, born at Kottbus (Brandenburg). He studied at Berlin, Breslau, and Heidelberg; in 1863-66 made a scientific journey to South Africa, and in 1867 became an assistant in the Anatomical Institute at Berlin. In 1868 he was a member of the expedition to Aden to observe the total eclipse of the sun, and in 1847 of the expedition sent to Isphahan, Persia, to observe the transit of Venus. He was appointed in the latter year to the chair of comparative anatomy at the University of Berlin, and subsequently to that of physiology. Under commission from the Royal Academy of Sciences, Berlin, he visited the Mediterranean countries in 1881-82 for the study of electric fishes. His publications include: *Drei Jahre in Südafrika* (1868); *Die Eingeborenen Südafrikas* (1873), anatomical and ethnographical observations; *Untersuchungen über den feinem Bau des Fischgehirns* (1878); and *Die elektrischen Fische* (2 parts, 1886-90).

FRITSCH, JOHANN (1849—). A German neurologist, born at Tepl, Bohemia. He studied at the University of Vienna, was appointed a lecturer there, and afterwards professor of psychiatry. His publications include: *Ueber die primäre Verrücktheit* (1879), and *Erfahrungen über Simulation geistiger Störung* (1890).

FRITSCH, KARL (1812-79). An Austrian meteorologist, born at Prague. He attended the university there, was for a time a Government official, but privately pursued meteorological investigations, and from 1862 to his retirement in 1872 was vice-director of the Austrian meteorological service. Large increase was made by him in the number of observation stations, and he contributed valuable articles to the publications of the Vienna Academy and of the Oesterreichische Gesellschaft für Meteorologie.

FRITSCH, KARL. Baron (1838—). A German geologist, born at Weimar. He studied at the University of Göttingen, and in 1873 became professor of geology at Halle. His publications include: *Reisebilder von den Kanarischen Inseln* (1867); with Reiz, *Geologische Beschreibung der Insel Tenerife* (1868); and *Allgemeine Geologie* (1888).

FRITZ, frits, DER ALTE (Ger., Old Fritz). A nickname given by the soldiers to Frederick the Great.

FRITZ, JOHN (1822—). An American expert in the manufacture of iron and steel, born at Londonderry, Pa. He was trained as a machinist in small establishments at Parkersburg and Norristown, and afterwards was employed in the construction of rolling-mills. In this connection he made so thorough a study of the details of iron and steel manufacture as to become an authority on the subject, and to be commissioned with the equipment of the Cambria Iron Works and the well-known Bethlehem Iron and Steel Works. For many years he was manager of the latter. He was among the first to introduce the Bessemer process into the United States, and a pioneer in other methods now generally used. In his honor a medal was established by a group of scientists and manufacturers in 1902, to be known by his name and to be awarded in recognition of notable discoveries in industry and science.

FRITZ, SAMUEL (1653-1728). A German Jesuit missionary, born in Bohemia. He entered the Jesuit Order, and in 1686 became a missionary on the Upper Amazon. Owing to ill health he withdrew to the Portuguese colony of Para, at the mouth of the river, and was held prisoner as spy there until 1691, by the Governor. Having been liberated and having reported to the Viceroy at Lima his various observations, he returned to his missionary field in 1693. During his forty-two years of activity among the Indians he founded the Omaguas missions and others, and prepared the material for his great map of the Amazon. This appeared at Quito in 1707, in the *Lettres édifiantes* (vol. xii.) in 1717, and was for many years the recognized authority on the region included by the river system.

FRITZ, UNSER (Ger., Our Fritz). A name given by the Germans to Frederick William, Crown Prince of Prussia, later Emperor Frederick III.

FRITZLAR, frits'lär, HERBERT and HERMANN VON. See HERBERT and HERMANN VON FRITZLAR.

FRITZNER, frits'nër, JOHANN (1812-93). A Norwegian lexicographer, born at Askö, near Bergen. He was educated at Christiania, and after holding several pastorates devoted himself entirely to scientific labors, as a result of which he published the *Ordbog over det gamle norske Sprog* (2d ed. 1884 et seq.), an excellent dictionary of ancient Norse.

FRITZSCHE, frit'she, ADOLF THEODOR HERMANN (1818-78). A German philologist. He was born at Groitzsch, Saxony, and was educated at Leipzig, where, after an activity of several years at the University of Giessen, he occupied the chair of philology from 1850 until his death. Besides original poems in Latin and German, he published valuable editions of several works of the Greek and Roman classics, the most noteworthy being the editions of *Theocritus* (2d ed. 1869), and of the *Satires of Horace* (1875-76).

FRITZSCHE, CHRISTIAN FRIEDRICH (1776-1850). A German theologian, born at Naundorf. He was educated at Leipzig, and was professor of theology at Halle from 1830 until his death. During a great part of this time he acted as censor for theological publications. Besides numerous articles published as *Fritzschorum Opuscula Academica* (1838), he wrote *De Anamartesia Jesu Christi* (1835-37), and several minor works.

FRITZSCHE, FRANZ VOLKMAR (1806-87). A German classical scholar, son of Christian Friedrich Fritzsche. He was born at Steinbach, in Saxony, and after studying under Beck and Hermann at the University of Leipzig, was professor of eloquence and poetry at Rostock from 1828 until his death. His works deal chiefly with Lucian and the Greek dramatists, particularly Aristophanes. Among the most important are the *Questiones Lucianæ* (1826); an edition of the *Dialogi Deorum* (1829); and of Aristophanes's *Thesmophoriazusæ* (with a commentary, 1838) and *Ranæ* (1845); and a critical edition of Lucian's complete works (1860-74). In defense of his old teacher, Hermann, he published *Reconsion des Buches Æschylos Eumeniden von K. O. Müller* (1834).

FRITZSCHE, KARL FRIEDRICH AUGUST (1801-46). A German theologian, the eldest son of Christian Friedrich Fritzsche. He studied under his

father and subsequently attended the University of Leipzig. After holding a professorship at that institution for one year, he was successively appointed to the chair of theology at Rostock (1826-41), and Giessen (1841-46). His philological interpretations of biblical texts are considered accurate, and in the defense of his views he revealed himself a skillful controversialist. His principal works are the *Commentaries on Matthew* (1826); *Mark* (1830); and the *Epistle to the Romans* (1836-43).

FRITZSCHE, OTTO FRIDOLIN (1812-96). A German theologian, son of Christian Friedrich Fritzsche, born at Dobrilugk, southwest of Frankfurt; he studied at Halle, became professor extraordinary at Zurich, 1837; full professor, 1842; and also chief librarian at the cantonal library in 1844. He published a critical edition of Lactantius (1842-44); *The Life and Writings of Theodore of Mopsuestia* (1836), and his *Exegetical Fragments* (1847); Anselm's *Cur Deus Homo?* (1868); and other works. He is best known by his work on the Old Testament *Apocrypha and Pseudepigrapha* (6 vols., 1851-60).

FRIULI, frî-ô-lee (Lat. *Forum Julii*). The name of a district on the north and northeast shores of the Adriatic Sea, now forming the Province of Udine, Italy, and the Austrian coast districts of Görz and Gradisca (Map: Italy, G 1). Friuli was anciently one of the thirty-six duchies into which the Longobards divided the north of Italy. It was from an early period divided into Tyrolese and Venetian Friuli, the former of which came into the possession of Austria in 1500, while the latter remained attached to Venice till the Peace of Campo-Formio (1797), when it also was given to Austria. Venetian Friuli finally came into the possession of Italy in 1866. The inhabitants, called Furlani, are for the most part Italian, but speak a peculiar dialect.

FRIULI, DUKE OF. See DUROC, GÉRAUD CHRISTOPHE MICHEL.

FRIZZLE. A breed of fowls, so called from the strangely curled ends of the feathers, especially those of the neck and back. They are bred largely for their grotesque appearance, but are hardy and useful.

FRÖBEL, frê-bel, FRIEDRICH WILHELM AUGUST (1782-1852). A German educationist, the famous promoter of what is known as the kindergarten movement. He was born at Oberweissbach, in Thuringia, April 21, 1782, where his father was a pastor of the old Lutheran Church. As his mother died while her son was an infant, the boyhood of the future friend of children was lonely, and his father's second marriage did not increase the happiness of the child. He became strongly introspective, and the severity of the religious influences under which he was trained placed him in a morbid attitude toward life, both the present and the future, a disposition which he overcame in his majority. At the age of ten years, he was sent to his uncle in the town of Ilm, where a happier life began. When fifteen he was apprenticed to a forester, and his duties were such that while he added to his knowledge of the outer world, he could devote himself (as he says) "in many various ways to self-education, self-instruction, and moral ad-

vancement. Especially did I love to indulge my old habit of self-observation and introspection."

In 1789, when the days of his apprenticeship were over, he went to Jena, and for several months came under the influence of the university, where his brother had been enrolled as a student of medicine. His studies were irregular and unfruitful, and at length, after confinement for several weeks in the 'carcer,' because he had not money to pay his bills, he withdrew from the university and secured employment in the Office of Woods and Forests, in the Territory of Bamberg. He was then brought again into close companionship with Nature, for his calling required him to live out of doors in a region of lovely scenery. After a short service of this kind, he was engaged as a surveyor in the service of the Bavarian Government, and later he became manager of a private estate. Having inherited a little property at the death of an uncle, he determined to become an architect, and for this purpose went to Frankfort-on-the-Main. Gruner, the master of the Frankfort Model School, then said to him: "Give up architecture. It is not your vocation at all. Become a teacher. We want a teacher in our own school. Say you will agree, and the place shall be yours." The young man accepted, and thus began his educational career. Gruner had been a pupil of Pestalozzi, whose name was the watchword of the Frankfort School. "It soon became evident to me," says Fröbel, "that Pestalozzi was to be also the watchword of my life." So Fröbel went to Yverdon and remained, for a fortnight, on a visit to the great educational reformer, whom he greatly admired, but whose methods he did not wholly approve. Uncertainty as to his calling, due perhaps to fickleness, perhaps to versatility, perhaps to genius, still embarrassed him. Several openings came to him, but none attracted him. So he returned to Pestalozzi and remained many months at Yverdon, where he wrote out an account of the work there in progress. His career continued uncertain, and he tried once more the environment of university life, first at Göttingen, and then at Berlin, where he showed such proficiency in mineralogy that his professor, Dr. Weiss, gave him an assistant's post in the mineralogical museum. War interrupted this service. In 1813 he joined Lützow's famous troop and saw some active service, and again in 1815 he enlisted as a volunteer. At the close of the war he determined to devote himself to the promotion of education. A curious passage in his autobiography declares that in the mineralogical laboratory "the stones in my hand turn to living, speaking forms. The crystal-world, in symbolic fashion, bore unimpeachable witness to me, through its brilliant unvarying shapes, of life and of the laws of human life, and spoke to me with silent yet true and readable speech of the real life of the world of mankind."

His approaching marriage (in 1818) may have had some influence in concentrating his mind upon the purpose of life, for he founded in 1816 a school at Greisheim (afterwards removed to Keilhau), called 'the Universal German Educational Institute,' and in it he proceeded to develop his plans. Up to this time all the events of his life had been preparatory. He was now thirty-six years old, his life half gone. During

the next thirty-four years his work was accomplished.

Eight years later he published his most important book, a volume entitled *Menschen-erziehung* (Education of Man), which is a sort of cornerstone in his philosophy of education. Notwithstanding its comprehensive title, it really discusses the education of a child. The Institute awakened suspicion, and finally opposition, on the part of conservative governments, and the Prince of Schwarzburg-Rudolstadt caused an official inspection of it to be made. The report, on the whole, was favorable. Fröbel's attention was now called by Krause (a well-known philosopher, whose acquaintance he had made) to the writings of Comenius, and from them he received a fresh impulse toward the development of his educational plans. After unsuccessful attempts to establish his Institute at Helba, near Meiningen, and afterwards near Lucerne, at Willisau, the Bernese Government invited Fröbel to consider a plan for founding an orphanage at Burgdorf. To this place he removed in 1835, and success followed the change. It is said that he considered, at this time, a visit to the United States in order to establish his system in a new country. He was now committed fully to the doctrine that the education of the nursery must be reformed, and the need of training for mothers became more and more evident to him. After a short stay in Switzerland, he went to Berlin in 1836, returned to Keilhau, and then established himself in Blankenburg, a small town not far from Keilhau. Langenthal, Middendorf, and Barop were his serviceable assistants. About this time he hit upon the name 'kindergarten,' which has since been introduced into many lands and many tongues—a much better term than one originally employed by Fröbel—'Anstalt für Kleinkinderpflege' (an institution for the care of little children). His friend Barop tells this story: "Middendorf and I were one day walking to Blankenburg with him over the Steiger Pass. He kept on repeating, 'Oh, if I could only think of a good name for my youngest born!' Blankenburg lay at our feet, and he walked moodily toward it. Suddenly he stood still as if riveted to the spot, and his eyes grew wonderfully bright. Then he shouted to the mountain so that it echoed to the four winds, 'Eureka! Kindergarten shall the institute be called!'"

Embarrassments still beset him. His ideas were not generally accepted; he lacked money for the maintenance of his school; his publications were not remunerative; more than this, his nephew, Carl Fröbel, a professor at Zurich, became the loud advocate of measures which were radical, if not revolutionary, and Frederick Fröbel was accredited with his nephew's opinions. In 1851 Von Raumer, Minister of Education and Public Worship, forbade the foundation of kindergartens in Prussia, and the edict remained in force until 1860, long after Fröbel's death. After 1850 Fröbel made his home in Marienthal, where the Grand Duke of Weimar gave him the use of a country seat. Here he was aided in his school by Luise Levin, who in 1851 became his second wife, and by Alwine Middendorf, who married Dr. W. Lange, the future editor of his writings. His death occurred June 21, 1852. The school at Marienthal was then removed again to Keilhau.

Fröbel's literary style was not good, and his

works were never popular; but his thoughts arrested the attention of able and influential people, and by these interpreters and followers kindergarten methods have been introduced into many countries. "Let childhood ripen the children," says H. C. Bowen, "is the keynote of the new gospel." "It is what he did for the education of children between the ages of three and seven that chiefly demands our gratitude." As a statement of his principles, the summary given by H. C. Bowen is adequate: "The main principles, it will be remembered, whose applications form Fröbel's system, are: self-activity, to produce development; all-sided connectedness and unbroken continuity, to help the right acquisition of knowledge; creativeness or expressive activity, to produce assimilation of knowledge, growth or power, and acquisition of skill; well-ordered physical activity, to develop the physical body and its powers; and happy and harmonious surroundings, to foster and help all these." (*Fröbel and Education by Self-Activity*, pp. 180-81.)

The principal writings of Fröbel have been collected in three volumes by W. Lange (Berlin, 1862), and by Friedrich Seidel (Vienna, 1883). Among them the most important is the *Education of Man*, which appeared in 1826. It has been translated into French and into English. The *Mutter- und Kose-Lieder* (Mother's Songs, Games, and Stories) has had many translators. The autobiographies were translated by H. K. Moore and Emilie Michaelis, and in part also by Miss Lucy Wheelock (new ed. London, 1899).

In addition to his own writings, materials pertaining to the life and influence of Fröbel are abundant, and are enumerated in bibliographies that are readily accessible. A selection is not easy. Dr. Barnard's collection of *Papers on Fröbel's Kindergarten* (Hartford, 1881) is comprehensive and important. There are two English translations of *The Education of Man*, one by Miss Josephine Jarvis (New York, 1885) and the other by W. N. Hailman (ib., 1887). The *Mother Play* (ib., 1895), in two volumes, was translated by Miss Susan E. Blow, who has also written a book on *Symbolic Education* (ib., 1894), a commentary on the first five songs of the *Mother Play*, and a volume entitled *Letters to a Mother* (ib., 1900).

Among the estimates of Fröbel's work, these citations may be made. Henry Barnard declared the kindergarten to be by far the most original, attractive, and philosophical form of infant development the world has yet seen. Dr. James Ward holds that the kindergarten system, in the hands of one who understands it, produces admirable results, but is apt to be too mechanical and formal. F. W. Parker says that the kindergarten is the most important, far-reaching educational reform of the nineteenth century. Mr. Quick in his *Educational Reformers* (New York, 1890), from which these words are taken, concludes his estimate by saying that among those who have contributed to the science of education there are probably no greater names than those of Pestalozzi and Fröbel. The memoir by H. Courthope Bowen in the Great Educators Series, edited by Nicholas Murray Butler (New York, 1897), is an admirable study of Fröbel's principles. The fullest biography is that by A. B. Hauschmann. A short memoir was written by Miss Emily Shirreff. Of the last four years of

Frobel's life there are delightful reminiscences by an accomplished enthusiast, the Baroness von Marenholtz-Bülow, translated by Mrs. Horace Mann (Boston, 1887). Two autobiographical fragments (a letter to the Duke of Meiningen, and a letter to the philosopher Krause), which narrate the perplexities and obstacles of his early life, are contained in a volume entitled *Autobiography of Frobel* (Syraese, 1889). It also includes a convenient bibliography. See KINDERGARTEN; PEDAGOGY; CHILD PSYCHOLOGY.

FROBEL, JULIUS (1805-93). A German writer and politician, nephew of Friedrich Frobel. After studying at Munich, Weimar, and Berlin, he went to Switzerland, and in 1833 became professor of mineralogy in the university of Zurich. In the interests of the extreme Radical Party, he edited *Der schweizerische Republikaner*. In 1844 he established a publishing house at Zurich, and issued several scientific works and many political pamphlets. Some of his works were suppressed by the Government. In 1846 he took up his residence in Dresden, until the Revolution of 1848, when he became a leader of the Democrats and a member of the National Assembly at Frankfort-on-the-Main. He accompanied Robert Blum to Vienna, and was arrested and sentenced to death, but was pardoned by Windischgrätz. After the dissolution of the Parliament he came to the United States; edited a German paper in New York; went, in 1850, to Nicaragua, and afterwards engaged in one or two commercial expeditions to Santa Fé and Chihuahua. In 1855 he edited a journal in San Francisco, and in 1857 returned to Germany. From 1862 to 1873 he edited newspapers in Vienna and Munich. He was German consul at Smyrna from 1873 to 1876, and at Algiers from 1876 to 1889. He retired from active life in 1890. His works include: *Aus Amerika* (1857-58), translated by himself in 1859 under the title of *Seven Years' Travel in Central America, Northern Mexico, and the Far West*; *Die Wirtschaft des Menschengeschlechts* (1870-76); and *Ein Lebenslauf* (1890-91), his autobiography.

FROBEN, frō'ben, or FROBENIUS, JOANES (1460-1527). A German scholar and printer. He was born at Hammelburg; was educated at the University of Basel, and established in Basel, in 1491, a printing press, at which the art of printing was first brought to a high degree of excellence in Germany. An intimate friend of Erasmus, he not only printed the latter's writings, but had his help in the editions that he printed of Saint Jerome, Saint Cyprian, Tertullian, Hillary of Poitiers, and Saint Ambrose. He did not live to carry out his project of editing the Greek Fathers, but it was creditably done by his son Jerome and his son-in-law, Nikolaus Episcopiuss. See ERASMUS.

FROBERGER, frō'bër-gër, JOHANN JAKOB (c.1605-67). A German organist, born probably at Halle. When very young he entered the Imperial choir in Vienna, in 1637 was Court organist there, and the same year went to Rome to study under Frescobaldi. He was again Court organist, 1641-45 and 1653-57, in Vienna, and then made a series of concert tours, appearing with great success in London and Paris. Froberger is a most important figure in the history of organ music, combining German power of ex-

pression with Italian nicety of form, but his numerous compositions are now seldom heard. He died at Héricourt, France.

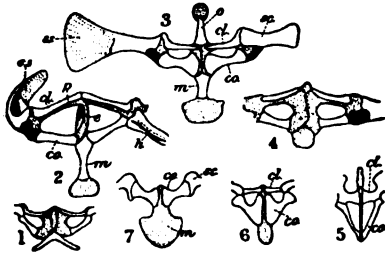
FROBISHER, Sir MARTIN (1535?-94). An English navigator and the first of his nation to seek a northwest passage to China. He was born either at Doncaster or Altofts, in Yorkshire, and belonged to a family which came originally from Wales. His early years were spent in voyages to the coast of North Africa, and to the Levant. In 1575, at the instigation of Elizabeth, he received a license from the Muscovy Company to search for the Northwest Passage. With two vessels of 25 tons each and a pinnace of 10 tons, he sailed north in 1576, sighted the southern point of Greenland, which he took to be the Friesland of the brothers Zeni, and came a few days later to a cape he named Queen Elizabeth's Foreland, near the southeast end of Frobisher Bay, which he supposed to be a strait. After a fortnight's exploration of the coasts and islands, he returned to England, bringing with him ore picked up on one of the islands he discovered. The prospect of unlimited wealth aroused the attention of the merchant adventurers of the time. A second expedition, better equipped than the first, was fitted out and the command was given to Frobisher. He sailed in May, 1577, but his activity was chiefly confined to hunting for gold, and his discoveries, which were comparatively trifling, were restricted to the locality which he had previously visited. A third expedition, with fifteen ships, was sent out in the year following with no other result than the discovery of a new strait, which was not explored until the time of Henry Hudson. Frobisher afterwards served under Drake in the West Indies; and was knighted for distinguished service in the fight with the Spanish Armada (1588). In the spring of 1591 he was sent by Sir Walter Raleigh with a squadron to ravage the Spanish coast, and hold the attention of the Spanish fleet while efforts were made to intercept the merchant vessels laden with bullion on their way from Panama. He died on November 7, 1594, from the effects of a wound received while leading an attack by sea against Brest, then in the hands of the Spaniards. The narrative of Frobisher's three voyages may be found in the Hakluyt Society Publications for 1867. For an account of his life, consult Jones (London, 1878).

FROBISHER BAY. An inlet of Davis Strait, in North America, opening westward between Hudson Strait and Cumberland Peninsula, into the territory called the Frobisher Meta Incognita, at the southern end of Baffin Land (Map: North America, M 3). It is about 200 miles long and above 20 wide, with rugged mountainous shores. It was till Hall's voyage called Frobisher Strait, being erroneously regarded as a passage into Hudson Bay.

FROG (AS. *frogga*, Icel. *froskr*, OHG. *frosch*, Ger. *Frosch*; ultimately connected with OHG. *frō*, Ger. *froh*, joyous, Skt. *prñ*, to jump). Any member of the Ranidae, a family of tailless Amphibia, of the group Firmisternia (q.v.), i.e. the two halves of the shoulder-girdle meet and are firmly united in the median ventral line, so that the chest cannot be expanded; and in this family, as distinctive from other Firmisternia, the sacral diapophyses are cylindrical. The young, known as 'tadpoles,' live in the water, have fringe-like external gills, which disappear while they are still

young, are without legs, and have a tail provided with a membranous swimming-fin.

The family Ranidæ is divided into three sub-families, according to the arrangement of the



TYPES OF SHOULDER-GIRDLE.

1, 2, Archerfous (Bombinator and Bufo); 3-7, Firmisternal types (3, adult Rana; 4, young Rana, showing change from archerfous to firmisternal type with advancing age; 5, Hyla; 6, Brevicaps; 7, Cacopus). Cartilaginous parts are dotted; ossified parts are left white. Lettering: *cl*, clavicle; *co*, coracoid; *e*, epicoracoidal cartilage, *h*, humerus; *m*, metastrut; *o*, omosternum; *p*, precoracoid; *sc*, scapula; *ss*, suprascapula.

teeth: (1) *Ceratobatrachina*, with teeth in both jaws. This is represented alone by the great horned, tree-climbing frog (*Ceratobatrachus Guentheri*) of the Solomon Islands, which is remarkable chiefly for its extraordinary adaptation in color and appearance generally to its customary surroundings, giving it entire concealment from ordinary observation. (2) *Ranina*, with teeth (vomerine) in the upper but none in the lower jaws. This is the group of true frogs, regarded as a family by most authors previous to 1901, and typified by the genus *Rana*, which contains about 140 species. (3) *Dendrobatina*, an aberrant group of South American and African frogs, with no teeth at all. They are small and usually brightly colored, and take remarkable care of their young, the mother allowing the tadpoles to fasten themselves by a secretion to her back when their native puddle dries, and thus carrying them to a safer place. One Brazilian species (*Dendrobates tinctorius*) furnishes from its skin the poisonous secretion used by bird-fanciers to change the color of the plumage of the Amazon green parrots.

There are about 270 species of Ranidæ, which are distributed over nearly all parts of the world except Australia; but there are very few species in South America, and these only in the northern part. In the United States the family is well represented by thirteen species of the genus *Rana*. Of these the bullfrog (*Rana Catesbiana*), so named on account of its bellying note, is perhaps our most widely known, as it is our most characteristic frog. It is very large, attaining a length of eight inches, loves the shore, and is green with olive and dusky blotches. (See BULLFROG.) It is equaled in size only by an East Indian species (*Rana tigrina*), and by one in the Solomon Islands (*Rana Guppyi*). The leopard-frog (q.v.) or shad-frog (*Rana virescens*) is green or often brassy-colored, with two rows of



FROG CARRYING TADPOLES.

black, white-edged blotches on the back. It is the commonest North American Rana. The wood-frog (*Rana sylvatica*) is small and reddish brown, with a dark band on each side of the head; it is the most silent frog of the genus, and avoids water except at the breeding season, and its brown color well conceals it among the fallen forest leaves. The green spring-frog (q.v.) (*Rana clamata*) inhabits cold springs. It is brown or green above and white below, and may be readily distinguished by the very large ear-drums. Like most aquatic animals, frogs can change slightly the color of the skin, depending on external conditions. Two species of *Rana* are common in Europe, viz. *Rana esculenta* and *Rana temporaria*. The latter alone is indigenous to Great Britain, and varieties of it extend throughout temperate Europe and Asia to Japan, and one (variety *pretiosa*) exists in the Western United States. The edible frog (*Rana esculenta*), however, has been introduced into England. An Indian species (*Rana breviceps*) and several South African species burrow in the ground.

Besides the true frogs, several other families, such as the spadefoots (Pelobatidæ), the tree-frogs (Hylidæ), and the piping frogs (Hylodes), are often so called. These show structural affinities which bring them as near to the toads as to the frogs, and are described elsewhere under their separate names.

ECOLOGY AND HABITS. The skin of frogs is usually smooth and free from warts or horny excrescences. It is invested with a colorless epidermis, which is shed from time to time as the creature grows; this splits along the back and thighs, is worked over the head like the taking off of a shirt, and usually eaten by the wearer. The deeper layers contain much pigment, in cells which are more or less under muscular control, enabling frogs to change their hue to conform to the background. (For further information on this point, see METACHROISIS; TREE-FROG.) The skin also secretes in numerous glands a viscid, milky fluid, which is of poisonous character—in some species very decided—and is their only defensive property. That obtained from a South American frog is said to be used as an arrow-poison by the Amazonian Indians. In a rare East Indian form, the arboreal flying frog (q.v.), the skin spreads into broad webs between the greatly extended toes, enabling the animal to make long sailing leaps, analogous to those of the flying squirrel. All frogs move on land by leaps, which are often of surprising vigor and extent.

Frogs are carnivorous, and in the season of activity are likely to be very voracious. The terrestrial and arboreal forms feed mainly on insects, worms, etc. The aquatic kinds also catch insects, but subsist more on aquatic animals—worms, tadpoles, small fishes, and other frogs. These are seized and slowly swallowed, often, where the prey is large, so slowly that the engulfed parts will be digested before the remainder, perhaps still alive, has been got within the mouth.

Extremes of cold or drought in climate must be avoided by frogs. Moisture of the skin is necessary to their health, and in very dry places or seasons they survive only by going deeply under ground. Thus some tropical species get through the 'dry season.' The frogs of northern climates endure the winter by clustering about

spring-holes and other places where the water is comparatively warm and free of ice; or else by hibernating in the mud. Terrestrial species bury themselves for the winter in the loam, or burrow into the dry dust of rotting logs and stumps. Their vitality is strong, and their power of regeneration from partial congelation is very great.

Though most species live always in or near water, many spend the greater part of their time away from it, and often in bushes or trees. These, however, go to the water to breed; and as this function is likely to demand attention early in the spring, it is then that these animals make themselves most conspicuous by the incessantly uttered croaking or rattling calls of the males, which are almost as varied as the songs of the birds, and more ventriloquistic. These are wholly the cries of the male frogs, and cease when the mates have been found and have spawned; and to assist in producing them many species have gular air-sacs, which are connected with the vocal organs and furnish the power required for the loud and insistent utterances. The great ear-drums correlated with this vocal power are conspicuous in many species.

The reproductive habits of frogs are various. All of our common species lay their eggs in water, the eggs being fertilized as they are laid. As the eggs are laid they are inclosed in a gelatinous envelope secreted by the female. This swells and protects the eggs from injury, from



ACTION OF FROG'S TONGUE IN CATCHING A FLY.

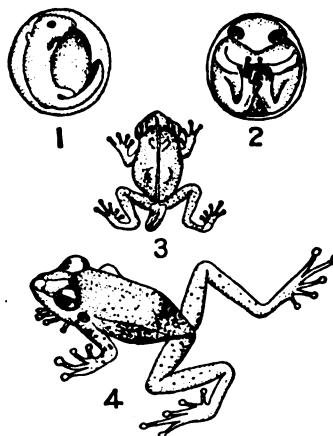
being fed upon, from the direct rays of the sun, and in some species it serves to float the eggs at the surface of the water, where oxygen is most abundant; finally, the envelope serves as food for the young frog. The mouth of the tadpole is small and provided with a horny beak, which takes the place of the teeth which are not yet developed. The tadpole feeds on algæ that cover stones, and on the flesh of dead animals. The long, spirally coiled intestine, which can be seen on the under side of the animal, is an adaptation to its prevailing herbivorous diet, which requires a prolonged digestion.

The tadpole usually lives in the water for two or three months before it takes to land. In the bullfrog, however, the transformation (see TOAD) does not take place until the second summer.

In many tropical frogs the reproductive habits are much modified. One species (*Phyllobates trinitatis*) of Venezuela and Trinidad carries its tadpoles on its back, to which the young attach themselves by means of their suckers. A frog of the Seychelles Islands lives in the tree-ferns far from water, and carries its young about on its back, to which they are attached by their bellies. In the Kameruns lives a frog that lays its eggs in a foamy mass on the leaves of a tree. When the larvæ are developed the mass becomes slimy and the tadpoles swim about it, and when a heavy rain falls they are washed into pools of water lying at the bases of the trees. The foam is probably produced as it is in culinary operations, by air being entangled in it by a beating that the frog gives the jelly with its feet. The in-

closed air may well serve in respiration. Compare TOAD.

UTILITIES. Among both civilized and savage men frogs are a culinary dainty. The edible European frog is so much prized in France that



DEVELOPMENT OF HYLODES.

Life History of *Hylodes Martinicensis*: 1. An egg with embryo about seven days old. 2. Embryo twelve days old. 3. Young frog just hatched. 4. Adult male, natural size.

it is bred for the market in large preserves. In the United States both the bullfrog and spring frog are sold in the markets. In France and the United States the hind legs alone are eaten; they are known as 'saddles' to American market-men, and are usually served at table fried. In Germany all the muscular parts are served stewed, often with sauce. Frogs have enabled man to contribute much to his knowledge of physiology. The tail of the tadpole, so frequently fed on by dragon-fly larvæ and other aquatic enemies, has great capacity of regeneration. The study of its re-formation has added to our knowledge of the regeneration of animal tissue. The circulation of the blood, so readily seen by the aid of the microscope in the web of the frog's foot, is a classic and painless class-room demonstration. Observations on the response of frog-muscle to stimuli led the great Italian physiologist Galvani to the discovery of dynamical or current electricity, known to us as galvanic or voltaic electricity. See TREE-FROG; *Factors of Organic Evolution*, in article EVOLUTION.

Fossil Forms. Fossil frogs and toads have been found in the Eocene phosphate deposits of Southwestern France, and they seem to be identical with or very closely allied to the modern genera *Rana* and *Bufo*. The Miocene deposits of Germany, France, and Bohemia have also furnished fossil frogs and toads. The genus *Palæobatrachus* of the Oligocene lignites has been obtained in large numbers in both the larval tadpole stage and the adult tailless condition. Tailed batrachians, *Stegocephalia* (q.v.), were common members of the late Paleozoic and Mesozoic faunas. The stories of living frogs and toads being found in the middle of freshly broken blocks of stone, so commonly told in various parts of the country, are scarcely worthy of credence. They have originated either in deliberate falsehoods or in misapprehension on the part of the original observer.

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See Colored Plate of AMERICAN FROGS AND TOADS, accompanying the article TOAD.

FROG. See HORSE; HORSE-SHOEING.

FROG, RAILWAY. A built-up or cast framework of metal placed in railway tracks at switching points to enable the flanged wheels of the cars and locomotives to pass freely from the main track to the side track, or in the reverse direction. Frogs are known as rigid frogs and as spring-rail frogs. In first-class main tracks the spring-rail frog is now almost universally used. The principle of the spring-rail frog is explained by the accompanying diagram. In this diagram the rails A and B, leading to the frog, are the 'lead' rails. The turn-out 'wing rail' C is hinged and held in position by the spring; the main-track 'wing rail' D is fixed or rigid. In passing onto or out of the side track, the wheels Y or Z force back the spring-wing rail C by the wheel flanges entering between the wing rail and the frog-point. A car on the main track passes through the frog on a continuous rail, formed by the main rail, the frog-point, and the spring-wing rail, as indicated by the diagram. In a rigid frog the wing rail C is rigidly fastened away from the frog-point exactly the same as is the wing rail D, so as to have an open flangeway at all times. In a rigid frog there is a break in the main-track rails due to the open flangeway between

the wing rail C and the frog-point, while in a spring-rail frog there is no such break, due to the fact that the wing rail C is hinged and is held by a spring close against the frog-point. The early railway frogs were rigid frogs, and were made of cast iron. Frogs, whether rigid or spring rail, are now almost universally made of steel rails planed to shape, and held in the proper relation to each other by means of a base plate, bolts, and

clamps. For a concise technical description and discussion of frogs, consult Tratman, *Railway Track and Track Work* (New York, 1900).

FROG, NICHOLAS, or NIC. A national nickname of the Dutch. It first occurs in Arbuthnot's *Law is a Bottomless Pit*.

FROGBIT. A popular name of certain water plants of the order Hydrocharidaceæ. See ANACHARIS; VALLISNERIA.

FROGFISH. One of a family of fishes (Antennariidæ), allied to the anglers. They are remarkable for excessive ugliness. The head is larger than the body, flattened, and spiny; the mouth is very large, with many teeth; the lips are often furnished with filaments; the pectoral fins are supported by a short stalk or wrist. The skin is naked in some species, scaly in others. The species are numerous and widely distributed, and many inhabit the deep sea. They hide themselves in the sand to surprise their prey. Compare ANGLER, and see Plate of ANGLERS AND BATFISH.

FROGHOPPER. See FROTH-FLY.

FROGMORE. A royal palace and mausoleum in Windsor Park, Berkshire, England (Map: London, E 1). The palace, purchased in 1800 by Queen Charlotte, was the residence of Queen Victoria's mother, and of Edward VII. when Prince of Wales. The handsome mausoleum of Romanesque architecture, erected in memory of Prince Albert, contains the remains of the Prince Consort and Queen Victoria.

FROGMOUTH. One of a group of large birds of the East Indian and Australian region, constituting a subfamily, the Podarginæ, of the nightjar family, Caprimulgidæ. They are noted for the very wide mouth, especially in the birds of the genus *Batrachostomus*, which is capable of completely engulfing small birds. They have a soft plumage, and are largely nocturnal like the owls. They have no oil-gland, but possess a pair of large powder-down patches, one on each side of the rump. One of the best-known species is the Australian 'more-pork' (q.v.). See Plate of NIGHTJARS, GUACHARO, ETC.

FROGS, THE. One of the most brilliant of the comedies of Aristophanes, which obtained the first prize on its representation in B.C. 405. The subject of the play is the decay of tragic art, for which Euripides, who had recently died, is attacked.

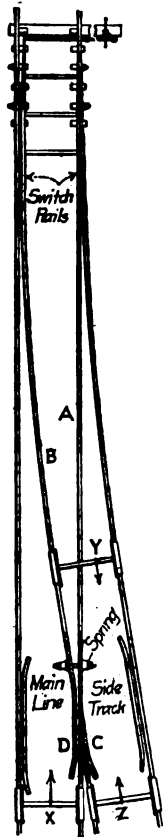
FROG-SHELL. A small gastropod mollusk of the genus *Ranella*, closely related to the tritons (family Tritonidæ), so called because of a fancied resemblance of its rough, flattened form and mottled colors to a frog. There are many species in tropical waters, all of which feed upon decaying matter and are useful scavengers. See Colored Plate of MARINE GASTROPODS.

FROGS' LEGS. See FISH AS FOOD.

FROG-SNAKE. See MATIPI.

FROG-SPAWN. The popular name of certain fresh-water algae which make green and slimy masses on the surface of ponds and sluggish streams. The name is applied properly to the gelatinous mass inclosing the ova of frogs. See ALGÆ; FROG.

FROG-SPITTLE (so called because formerly believed to be the spittle of frogs). A frothy substance appearing on weeds, grasses, etc., and



produced in self-protection by the nymphs of certain plant-bugs, called frog-hoppers. In England the substance is called cuckoo-spit.

FRÖHLICH, frē'lik, ABRAHAM EMANUEL (1796-1865). A Swiss poet, born at Brugg. From 1835 until his death he was pastor at Aarau. His poems and fables are very popular, and the fables rank high among literature of that variety. His works include: *Fabeln* (1825); *Das Evangelium Sankt Johannis in Liedern* (1830); *Elegien an Wieg' und Sarg* (1835); the epics *Ulrich Zwingli* (1840) and *Ulrich von Hutten* (1845). His collected works were published in 1853.

FROHMAN, CHARLES (1858—). An American theatrical manager, one of the leaders of what is commonly called the 'Theatrical Trust,' of which he is the producing partner. He was born in Sandusky, Ohio, and before he was twenty years old became advance agent for a traveling minstrel show. After having become an independent manager of various companies 'on the road,' he established himself in 1893 at the Empire Theatre, New York, and in the season of 1895-96 formed with several managerial firms the 'syndicate,' which has gradually strengthened its position till in many parts of the country it has a practical monopoly of playhouses. He has brought out as stars Maude Adams, Julia Marlowe, John Drew, and other well-known actors.

FROHMAN, DANIEL (1853—). An American theatrical manager, born in Sandusky, Ohio. In his youth he was employed in newspaper work in New York, but he early embarked in theatrical management with traveling companies. He has managed the Fifth Avenue and Madison Square theatres (previous to 1885), and more recently the Lyceum and Daly's Theatre, besides the Daniel Frohman Stock Company and various special attractions. He is in close relations with the so-called 'Theatrical Trust,' formed by his brother Charles Frohman.

FROHSCHAMMER, frō'shām - ēr, JAKOB (1821-93). A German theologian and philosopher, born at Illkofen, near Ratisbon, and educated at Munich. For more than forty years he was associated with the University of Munich, where he occupied the chair of philosophy from 1855 until his death. Because of his radical utterances on theology he incurred the opposition of the Vatican, and was compelled to resign his position as preacher at the university in 1855. A large number of his writings were directed against the authority of the Church in matters of science, the freedom of which he defended in the work entitled *Ueber die Freiheit der Wissenschaft*, in which in some respects the keynote of the *Kulturkampf* which agitated Germany during the seventies was already sounded. The dogma of infallibility was attacked by him with equal vigor in a number of publications, which involved him in a long and bitter controversy with Catholic theologians. In his philosophical writings he defends the idealistic conception of the universe—a conception possible through a central principle which he defines as 'fantasy.' This idea is carried out in several important publications, of which the following may here be cited: *Monaden und Weltphantasie* (1879); *Die Philosophie als Idealiswissenschaft und System* (1884); *Ueber das Mysterium Magnum des Daseins* (1891).

FROHSDORF, frōs'dōrf, or **FROSCHDORF**, frōsh'dōrf (originally Krottendorf). A village of Lower Austria, 30 miles south of Vienna (Map: Austria, E 2). It has acquired some political significance, owing to the fact that its castle was the residence of the Duchess of Angoulême after 1844, and later of the Count of Chambord (q.v.), and became the rendezvous of the elder Bourbon party.

FROISSART, frwä'sär', JEAN (c.1338-1410?). A French poet and historian, born at Valenciennes. He was destined for the Church, and consequently received a liberal education, but he soon displayed a passion for poetry and for the tales of chivalry. In 1361 he went to London to present to Queen Philippa a poem concerning the recent war between England and France. It secured for him a position as secretary to the Queen, who encouraged him to continue his work. In 1365 he made a journey to the Scottish Court at the expense and under the protection of Queen Philippa. In 1366 he left England in the train of the Black Prince, and in 1368 visited Italy under the protection of the Duke of Clarence. Upon the death of his patroness the Queen, in 1369, he returned to Valenciennes. Soon, however, he found new patrons who admired his writings. In 1370 he entered the service of Duke Wenceslas of Luxemburg. He was also befriended by Robert of Namur, to whom he dedicated the first book of his *Chronicles*, and by Guy of Châtillon, who, in 1373, appointed him curé of Lestines-les-Monts. For ten years he led an uneventful life, working upon his *Chronicles* or composing poems with Duke Wenceslas. In 1383 he became the chaplain of Guy of Châtillon, who had just inherited the County of Blois. Then for fifteen years Froissart traveled much, seeking men who could tell of the great wars in which they had taken part. Thus in 1388 he visited the Court of Gaston Phœbus at Béarn. To this journey we owe the striking description of this remarkable tyrant, whom Froissart admired. In 1394 he visited England a second time. Little is known of his life after he returned from England, and the date of his death is uncertain.

The work for which Froissart is famous is his four books of *Chronicles*, in which he recorded the events and wars of the last three-quarters of the ~~fourteenth~~ ^{fifteenth} century. He was engaged on this work for over forty years. He had little critical ability, and recorded supernatural tales with as much credence as he gave to knightly feats of arms. Nevertheless, he gives a masterly account of the character and manners of his age. He was able to describe most of the localities from his own knowledge, and he was fortunate in being able to consult important actors in every war which he described. Thus he learned of the Scottish wars from King David; of Crécy, from King Edward; of Poitiers, from the Black Prince; of the famous 'Great Companies,' from their commanders; of the death of Wat Tyler from Robert of Namur, who had been present.

In the first redaction of his first book he borrowed freely from Jehan le Bel's *Chronicle*. Later he made two revisions, and in each he deleted many of the portions borrowed from Jehan le Bel. One defect in his work, considered as an historical source, must be noted. Froissart was far from being impartial. In the first redaction of

his first book he was an English partisan. In the second redaction, undertaken at the wish of Robert of Namur, he suppressed much that was favorable to England. In the third redaction, which he made after 1400, when he was filled with grief for the murder of Richard II., the grandson of his former patroness, he made some very severe reflections on the English nation. The best editions of his *Chronicles* are those of Kervyn de Lettenhove (25 vols., Brussels, 1863-77) and Luce (Paris, 1869-88, incomplete), in the publications of the *Société de l'histoire de France*. There are many other editions and translations, for which see Potthart, *Bibliotheca Historica Medii ævi*, vol. i. (Berlin, 1896). Special mention should be made of the fine old English rendering by Lord Berners. Froissart is also noteworthy as a poet. He wrote many verses, which were greatly appreciated by his patrons. His first production was entitled *L'épînette amoureuse* ("The Little Thorn of Love"), and is an account of his boyhood and first love affair. The *Dit du Florin*, which is partly autobiographical, is the most pleasing of his poetical works. The most lengthy was his *Meliador*, which he read to Gaston Phœbus. It is a poem twice as long as the *Divine Comedy* of Dante, and is an echo of the tales of the 'Round Table'; but although it contains beautiful and interesting passages, as a whole it is exceedingly prolix and tiresome. It has been published by Longnon for the *Société des Anciens Textes* (3 vols., Paris, 1895-99). The other poems have been published by Scheler (3 vols., Brussels). For Froissart's life, consult the introductions to the two editions of his *Chronicles*, which have been cited, the secondary works given in Potthart, and especially Mary Darmesteter, *Froissart* (Paris, 1894).

FROLIC, THE. A British sloop of war captured in 1812 by the American sloop of war *Wasp*, under Captain Jacob Jones, who received a medal from Congress for the exploit.

FRÖLICH, frë'lik, LORENTZ (1820—). A Danish painter and engraver, born at Copenhagen. He studied in Dresden under Bendemann, and in Paris under Coutoure. Afterwards he lived much in France, and constantly exhibited at the Salons. His drawings and illustrations are especially successful and are widely known. Among his pictures are "Peasant Pursued by Wolves" (1838); "King Harold Blaataand" (1840); "Cupid and the Water-Sprite" (1845); and "Family of a Wood-God"; also some decorative paintings in the Court of Appeals at Flensburg, Prussia, and also in some public buildings of his native land.

FROLLO. A Roman knight, serving as Governor of France and killed by King Arthur, in an Arthurian legend of the fifteenth century, entitled *Arthur*, and other chronicles. He is also known as *Froll* or *Frolle*, and is mentioned in the first part of the ballad "King Arthur's Death," in Percy's *Reliques*.

FROLLO, CLAUDE. In Hugo's *Notre Dame de Paris*, the lover of Esmeralda and victim of Quasimodo, who hurls him from the cathedral tower. He is an archdeacon of Notre Dame, and practices mysterious forms of magic. Jehan Frollo is a student in the same work.

FROME, formerly FROME SELWOOD. An agricultural and manufacturing town in Somerset,

England, on the Frome, a branch of the Avon, 12 miles south-southeast of Bath, on the Great Western Railway (Map: England, D 5). Its staple products are broadcloths, silks, hats, ale, and cards for dressing woolen cloths. The town owns its water-works. The celebrated Selwood Forest, part of which still exists, was in the vicinity. Population, in 1891, 9600; in 1901, 11,000.

FROMENTIN, frô'mân'tân', EUGÈNE (1820-76). A French painter and author. He was born near La Rochelle, France, October 24, 1820. His father was a physician of note in La Rochelle, who had an inclination toward art, which he had cultivated, while a student in Paris, in the ateliers of Bertin, Gros, and Gérard. In November, 1839, at the age of nineteen, Eugène was sent to Paris to study law. He became also much interested in literature, and was associated intimately with eminent authors, as Benjamin Fillon, Michelet, Quinet, and Sainte-Beuve. He wrote much himself, and at this time formed the vivid and charming style so well known in his later works. Not until 1840, at the age of twenty, did Fromentin show any disposition toward painting. His first known sketch is a recollection of the presentation of the play of *Chatterton*, by Alfred de Vigny, at the Théâtre Français. It gives no promise of the talent which he developed later. In 1843 he received his license in law and began to study for the doctor's degree. At this time, partly under the influence of the depression attendant upon an attack of fever, he decided to abandon law. He first entered the atelier of a mediocre painter, named Remond, but a year later changed to that of Cabat. Fromentin occupied several studios in Paris, but finally settled in a little hotel in the Place Pigalle, which he occupied during the rest of his life. In 1846 occurred his first visit to Algeria. It was brief, and only a few sketches were brought back, but the main direction of his interest in life and art was then decided. Fromentin is essentially the painter of Northern Africa, the Sahara, and its oases. He first exhibited his Sahara pictures in the Salon of 1847. From this time on he was always either in the Sahara or in Paris.

Interest in Fromentin culminated in the Salon of 1859, when he received a first medal. The attention of Paris and the world had been especially awakened by his two newly published books: *Un été dans le Sahara*, which first appeared in the *Revue de Paris*, 1856, and *Une année dans le Sahel*, published in the *Revue des Deux Mondes*, in 1858. These two books were published together in 1879 by Plon, in a memorial edition, superbly illustrated with Fromentin's pictures of the Sahara. Fromentin published a novel, *Dominique*, in 1862. His most important literary effort is his critical work *Maîtres d'autrefois* (1871, a history of Dutch and Flemish painting). His paintings are characterized by brightness and harmony of color. Among the most important are: "A Farm Near La Rochelle" (1847), his earliest work; "Gazelle Hunt in the Hodna" (1857); "A Street in El-Aghouat," owned by the French Government; "An Arab Bivouac at Sunrise," in the collection of Mr. Edouard Delessert, Paris; "A Hunt with the Falcon" (1863), in the Louvre; and "An Arab Camp," his last picture, also in the Louvre. Several good examples of his works are in America,

notably in the Waters Collection, Baltimore, and in the Vanderbilt Collection, New York. Fromentin died suddenly at Saint-Maurice, near La Rochelle, August 27, 1876. Consult: Gonse, *Eugène Fromentin, peintre et écrivain* (Paris, 1881); Jouin, "Fromentin," in *Maîtres contemporains* (ib., 1887); Claretie, "Eugène Fromentin," in *Peintres et sculpteurs contemporains* (ib., 1882).

FROMMANN, frō'mān, GEORG KARL (1814-87). A German philologist, born in Coburg. One of his most important achievements was the revision of Luther's translation of the New Testament, which work he undertook in 1865 in association with ten other Protestant theologians. This revision was subsequently extended, at the request of the Protestant Conference, to the Old Testament; and the revised edition of the complete Bible appeared in 1892.

FROMMEL, frō'mēl, EMIL (1828-96). A German theologian and author. He was born at Karlsruhe, and studied at Halle, Erlangen, and Heidelberg. After holding several pastorates, he served as army chaplain in the Franco-German War of 1870-71, and in 1872 was appointed Court preacher at Berlin and pastor of the garrison in that city. His principal theological works include: *Die zehn Gebote Gottes in Predigten* (6th ed. 1898); *In drei Stufen*, an anthology (8th ed. 1890); *Festflammen* (6th ed. 1896); *Das Gebet des Herrn in Predigten* (4th ed. 1893). He also wrote tales and miscellaneous essays, collected and published under the title of *Gesammelte Schriften. Erzählungen für das Volk. Aufsätze und Vorträge* (1873-97).

FROMMEL, KARL LUDWIG (1789-1863). A German landscape painter and engraver, born at Birkenfeld, Oldenburg. He studied at Karlsruhe, under the Court engraver, Haldenwang, and went to Paris in 1809 to paint from nature for the Empress Josephine a cycle of twelve large landscapes in water-colors. He earned a considerable reputation during a prolonged stay in Italy (1812-17), was appointed professor at Karlsruhe after his return there, and became a very active promoter of several artistic enterprises. After a visit to London, in 1824, to acquaint himself with the technique of steel engraving, he opened at Karlsruhe a studio for that branch of art, and issued reproductions of well-known views in Italy which obtained a wide circulation. From 1830 to 1858 he was director of the picture gallery, which owes to his clever administration its present flourishing condition. In it are also preserved several of his attractive landscapes. Besides six original etchings, there are to be noted the engravings "Arricia Near Rome," "View of Tivoli," "Mount Vesuvius," and "Mount Etna," as some of the best among many commendable for characteristic conception and delicate execution.

FROMMEL-LINDEMANN, līn'de-mān, KARL AUGUST. See LINDEMANN-FROMMEL.

FROMONT JEUNE ET RISLER AÎNÉ, frō'mōn' zhēn à ré'slā' ā'nā' (Fr., Fromont Jr. and Risler Sr.). A novel by Alphonse Daudet (1874), the story of an ambitious bourgeoisie, Sidonie Chébe, who, after a marriage with the rich Risler, keeps up an intrigue with Fromont, and at last ruins her lover and the firm.

FROND (Lat. *frons*, OLat. pl. *frundes*, foliage). In botany, a term often used to designate the leaves of cryptogamous plants. It was originally introduced as distinctive of organs in which the functions of stem and leaf are combined, and was applied to the leaves of palms, etc. The term 'leaf' is now very generally used, even for mosses, ferns, etc., and the term 'thallus' for lichens. In algæ the term 'frond' is often used to designate the whole plant, except its organs of reproduction.

FRONDE, frōnd (Fr., sling). The name given to the period of domestic intrigues and political troubles in France during the minority of Louis XIV., from 1648 to 1653. The grasping and despotic policy of Mazarin had given offense to all classes. The princes and nobles saw themselves excluded from all high offices in the State, and their places filled by foreigners; the Parliament of Paris saw itself threatened in its political rights; and the people complained of the burden of taxes and administrative abuses. The Parliament, therefore, commenced a course of determined opposition, refusing to register the royal edicts, more especially the financial measures initiated by Mazarin. Among the leaders in opposition, in addition to the first president, Mathieu Molé, were the councilors Blancmesnil and Broussel. After Condé's victory over the Spaniards at Lens (August 20, 1648) had strengthened the hands of the Court party, violent measures were determined on, and on August 26, 1648, Blancmesnil and Broussel were arrested by order of Mazarin. The people took up arms, dispersed the Swiss Guard, and on the 27th of August erected barricades in the street around the Palais Royal. The Court now removed to Rueil, and after some negotiations yielded in so far that an ordinance was issued regulating the financial and judicial administration of the realm. This victory gave courage to the supporters of the Parliament, who continued to keep a sharp lookout on the Court, and were styled by the adherents of Mazarin *frondeurs*—i.e. censurers (literally, 'slingers'). The Court now resolved to suppress the movement, and on January 6, 1649, removed secretly to Saint-Germain, leaving Paris to be blockaded by the Prince of Condé with 7000 men. The Parliament, instigated by the astute Cardinal de Retz, and publicly supported by various nobles, including the Prince of Conti, the dukes of Longueville, Beaufort, Bouillon, and Elbeuf, and the Maréchal de la Mothe, called upon the people to resist. A sanguinary encounter at Charenton resulted in the defeat of the Frondeurs, and they were forced to enter into negotiations for peace. Accordingly, a treaty was made at Rueil, March 11, 1649, granting a general amnesty and regulating the matter of financial control. After the return of the Court to Paris in August, a new turn was given to the contest, the princes of the blood disputing the power with Mazarin. This, on January 18, 1650, led to the sudden arrest of Condé, Longueville, and Conti, which was the beginning of the new Fronde. The young sons of Louis XIII. were roused against Mazarin, and Marshal Turenne assumed the title of lieutenant-general of the royal army for the liberation of the princes. After some initial successes, Turenne, who was fighting in conjunction with the Spaniards, was finally completely defeated by Mazarin's

troops under De Plessis, near Rethel, on December 15, 1650. Mazarin returned to Paris, but found all parties against him, and his removal was insisted upon so urgently that he was obliged to release the princes and flee to the Netherlands. A system of intrigue was now substituted for force of arms, and the contest, which had begun for the interests of the people, was converted into a Court cabal. Turenne was gained over by the Queen Regent, Anne of Austria, De Retz by Cardinal Mazarin, and Condé, who had made himself generally odious by his haughty conduct, was obliged to flee for safety into Guienne. Louis XIV., who had now attained his fourteenth year, endeavored to induce Condé to return; but the latter, mistrusting the King's overtures, repaired to Bordeaux in 1651, where he had many adherents. There he commenced a regular war against the Court which might have had dangerous consequences had not Turenne opposed the Prince. On July 2, 1652, an engagement took place between the two parties in the outskirts of Paris. Condé was in danger of defeat, when, through the efforts of his friends, he was allowed to enter Paris. Paris itself, weary of these fruitless dissensions, now entered into negotiations with the Court, demanding, however, the final removal of Mazarin, who had meanwhile returned. This demand was complied with by Louis XIV., and the royal entry took place October 21, 1652. Various nobles were exiled as a result of the contest. Condé, who refused to enter into the compact, and had quitted Paris on October 15th, repaired to Champagne; and finally, finding no one disposed to take up arms in his cause, entered the Spanish service, and was declared a traitor. Mazarin returned to Paris, and was once more intrusted with the reins of government. Thus ended the period of the Fronde in Paris, for the last signs of revolt in the provinces were suppressed only in 1653. The defeat of the Frondeurs contributed to make Louis XIV. an absolute monarch. Consult: Saint-Aulaire, *Histoire de la Fronde* (Paris, 1860); Barante, *Le parlement de Paris et vie de M. Molé* (Paris, 1859); Perkins, *France Under Richelieu and Mazarin* (New York, 1888); Pardoe, *Louis XIV. and the Court of France*, etc. (London, 1888); *Memoirs of Cardinal de Retz* (London, 1896). See CONDÉ; LOUIS XIV.; RETZ, CARDINAL DE; TURENNE.

FRONSBERG, fróns'bèrk. See FRUNDSBERG, GEORG VON.

FRONSPERGER, fróns/pèrk-ër, LEONHARD (c.1520-75). A German writer on the art of war. He was born at Ulm, and began the study of military science in early boyhood. In his celebrated *Kriegsbuch kaiserlicher Kriegsgerechte und Ordnungen vom Geschütz* (4th ed. 1596; rendered into modern High German by F. W. A. Böhm, vol. i., 1819), he displays a remarkable knowledge of army organization, equipment, fortification, military law, articles of war, and artillery practice. He is generally considered the most competent German military writer of the sixteenth century.

FRONTAL BONE. See SKULL.

FRONT DE BŒUF, frôn de bœf. In Scott's *Ioanhoe*, a ferocious baron, who threatens Isaac the Jew in order to extort money. He is finally

burned to death with his castle when it is stormed by King Richard and Locksley.

FRONTENAC, frôn'tak', LOUIS DE BUADE, Comte de (c. 1621-98). The greatest of the Governors of New France. He was born in France about 1621. At an early age he entered the military service, and rapidly attained promotion. He became colonel at twenty-three and brigadier-general at twenty-six, and saw active service in Italy, Flanders, and Germany. In 1672 he was appointed to succeed De Courcelles as Governor of New France. Frontenac was choleric and arbitrary by nature, but extremely energetic, and sincerely ambitious to inaugurate an era of prosperity for Canada. His first act was to convene the three estates—Clergy, Nobles, and Commons—and to establish municipal government in Quebec. The royal policy, however, was adverse to the granting of extensive political rights to the Canadians, and the Governor's reforms in this direction were disapproved. He next became involved in controversies with the Jesuits, with the Intendant Talon, and with Perrot, the Governor at Montreal. These quarrels divided the colony into factions, and led at length to the recall of Frontenac in 1682. In 1689 he regained the King's favor, and was restored to his former position, which he held until his death, in November, 1698. Frontenac's first administration was especially marked by energy and tact in his dealings with the Indians, and by his encouragement of French explorations in the West. He aided Joliet, Marquette, and La Salle, and established posts at Mackinac, Niagara, and in the Illinois country. After his reappointment he waged a vigorous war against the Iroquois, who had reduced Canada to desolation, and against their allies and instigators, the English. The frontier towns of New England and New York were repeatedly ravaged by his punitive expeditions. His most signal achievement in these campaigns was the show of force by which he foiled Sir William Phips's fleet before Quebec in 1690. At different times he might have made peace with the Iroquois if he had been willing to abandon to their vengeance his Algonquin allies; but this he steadfastly refused to do, and it was not until his last campaign in the Mohawk country in 1696 that the Iroquois were brought to sue for peace. Consult: Winsor, *Cartier to Frontenac* (Boston, 1894); and Parkman, *Frontenac and New France Under Louis XIV.* (Boston, 1877).

FRONTERA, frôn-tä'rá. A seaport in the State of Tabasco, Mexico, 230 miles east by south of Vera Cruz; near the mouth of the Grijalva River on the Gulf of Campeachy. It is the port of San Juan Bautista, the capital of the State, and has a good harbor; its exports, which have an annual value of about \$400,000, comprise coffee, cocoa, and dyewoods. Frontera is the residence of a United States consular agent. Population, about 3000.

FRONTIER, MILITARY. The furthestmost limits of military lines of national defense, observation, and concentration. By the mutual consent of countries contiguous to each other, the military frontier is usually placed some little distance back of the actual geographical dividing line. The sentries of England and Spain at Gibraltar are separated by a strip of

land agreed upon as neutral territory. With the principal military countries of Europe the various mobilization schemes are designed to secure the greatest possible concentration on the frontier, where they are knitted together by a more or less complete system of forts or intrenched camps. Both France and Germany keep their frontier corps at a much higher peace strength than the remainder of their armies. The most important British Indian camps of exercise, as well as their strongest points of concentration, are along the military frontier of Northwestern British India. The *Militärgrenze*, or military frontier, was the former name of a narrow strip of land along the Turkish frontier in Hungary and Croatia-Slavonia, which had a special military constitution. See FORTIFICATION; MOBILIZATION.

FRONTINO, frôn-tě'nó. The horse of Rogero, in Ariosto's and Boiardo's *Orlando*. He received it from Brunello, who in turn had stolen it from Sacrepant. When mounted on it Rogero was invincible.

FRONTINUS, SEXTUS JULIUS. A Roman author, who flourished in the second half of the first century A.D. In A.D. 74 he was sent to Britain as Governor of that island, and obtained a great reputation by his conquest of the Silures, and his vigorous maintenance of the Imperial authority. He appears to have been twice consul in the course of his life, and to have held several other important offices, notably that of *curator aquarum*, or water commissioner. He died about A.D. 105. Several works are attributed to Frontinus, only two of which are certainly genuine, the *Strategematica*, a treatise on the art of war, in three books; and the *De Aquis Urbis Romæ*, in two. The latter is a highly important technical account of the Roman aqueducts, and the marvelous water supply of the ancient city. There is an edition of the *Strategematica*, by Gundermann (Leipzig, 1888); and of the *De Aquis*, by Herschel, in *Two Books on the Water Supply of the City of Rome* (Boston, 1899), including the text, translation, and commentary.

FRONTISPIECE (from OF. *frontispice*, ML. *frontispicium*, front view, from Lat. *frons*, front + *specere*, to look). The name generally given to an engraved and decorated title-page of a volume, or an engraving or other illustration placed opposite the title-page. The term was formerly used in architecture to denote the front or principal face of a building.

FRONTO, MARCUS CORNELIUS. A teacher and author. He was born at Cirta, in Numidia, and came to Rome in the reign of the Emperor Hadrian, where he soon obtained a high reputation as a teacher of eloquence. Antoninus Pius intrusted to him the education of Marcus Aurelius and Lucius Verus, both of whom always retained the warmest admiration of their preceptor. Fronto gradually rose to the highest offices of the Empire, became very wealthy, and died, it is thought, about A.D. 175. Until recently nothing was known of Fronto as an author, except from a few fragments of a grammatical treatise (*De Differentiis Vocabulorum*); but in the year 1814 Angelo Mai discovered in the Ambrosian Library at Milan a palimpsest, which, being deciphered, was found to contain a considerable number of Fronto's letters with some short

essays. These were published by Mai in 1815; and in the following year an edition was published at Berlin by Niebuhr, who wrote a critical preface, and also printed the commentaries of Buttmann and Heindorf. A few years afterwards Mai found in the library of the Vatican at Rome another palimpsest containing more than 100 of Fronto's letters, including his correspondence with the Emperor and with his royal pupils. The result was a new edition by Mai (Rome, 1823), embodying the new discoveries. The contents of these letters are on the whole unimportant, although they help to confirm the good opinion which history has formed of the Emperor Marcus Aurelius. The best edition is by Naber (Leipzig, 1867).

FRORIEP, frô'rêp, ROBERT (1804-61). A German physician, born at Jena, and educated at Bonn. In 1833 he received a call to the Pathological Museum of the Charité at Berlin, of which he was director for nearly thirteen years. His medical and surgical atlases are widely known. They include: *Chirurgische Kupfer tafeln* (96 parts, 1820-47); *Klinische Kupfer tafeln* (12 parts, 1828-37); *Atlas der Hautkrankheiten* (1837); *Pferderassen* (6th ed. 1874); and *Atlas Anatomicus* (6th ed. 1877). His treatise *On the Therapeutic Application of Electro-Magnetism in the Treatment of Rheumatic and Paralytic Affections* (English translation by R. M. Lawrence, 1850) was a very important contribution to electro-therapy in its day.

FROSCHDORF, frôsh'dôrf. See FROHSDORF.

FRÖSCHL, frësh'l, KARL (1848—). An Austrian genre and portrait painter, born in Vienna. He studied first at the Academy of his native city, then under Wilhelm Diez in Munich, whither he returned after a sojourn of two years (1874-76) in Italy. In 1884 he settled again in Vienna, became very popular through his attractive and humorous scenes from child-life, and was much sought as a portrait painter by members of the Imperial family and aristocracy. His female portraits in pastel are particularly successful. Reproductions of his child-life scenes are embodied in the collections *Goldene Zeitung* (Munich, 1882) and *Fröschl-Album* (Leipzig, 1890).

FROSINONE, frô'zè-nô'nâ. A city in South Italy, 53 miles southeast of Rome, near the junction of the River Cosa with the Sacco. There are ruins of the ancient Hernican Frusino, and large quantities of wine are marketed. Population of commune, in 1881, 10,000; in 1901, 11,191.

FROSSARD, frô'sâr'. CHARLES AUGUSTE (1807-75). A French general. He was born at Versailles, studied at the military school at Metz, and served with distinction in the army. He participated in the siege of Rome in 1849, commanded the Second Engineer Corps in the Crimean War, and in 1855 was promoted to be brigadier-general. He was chief of the engineering department during the Italian campaign of 1859, and was afterwards made an officer of the Legion of Honor, and appointed Governor of the Prince Imperial. In the war with Germany he commanded the Second Corps of the Army of the Rhine, and headed the attack upon Saarbrücken (August 2, 1870). He was taken prisoner at Metz, and was detained until the close of the war. He published a *Rapport sur les*

opérations du deuxième corps de l'armée du Rhin dans la campagne de 1870 (1872).

FROST (ME. *frost*, *forst*, AS. *forst*, from *freosan*, Eng. *freeze*). A formation of ice on the ground or on plants; also the temperature 32° Fahrenheit or 0° Centigrade that corresponds to the formation of ice and snow. When air whose dew-point is below 32° Fahrenheit comes in contact with a substance whose surface is colder than this, a portion of the aqueous vapor in the air is condensed upon that surface in the form of ice or frost; although this deposition is truly ice, yet the particles of ice are usually small, separate from each other, and reflect the rays of light in such a way as to make the deposit appear white, like crushed ice, instead of being transparent, as is the case with solid ice. In fact, the particles of ice usually have a crystalline structure, more or less perfect, as may easily be seen when moisture is deposited on the inside of a window-pane when the temperature outdoors is below freezing. In the latter case, when the air within the room has a dew-point far above the freezing temperature, the moisture first condenses in drops of dew upon the pane of glass, but is afterwards frozen into ice if the exterior cold is sufficiently intense.

When the air of the room has a dew-point below the freezing temperature, then the moisture is deposited upon the window-pane directly in the form of spiculæ or slender prisms of ice, and it is under these circumstances that the most delicate frost figures are formed. The latter is also the ordinary case in the formation of frost on vegetation and on the ground in the open air; in such a case every object is studded more or less thickly with small crystals of ice; the whole deposit is as white as snow, and is usually called 'hoar frost.' It frequently happens that rain (or sleet, which is frozen rain) falls on objects that are already colder than 32° Fahrenheit. In such cases the rain or sleet remains congealed as a layer of almost transparent ice on the upper surfaces of the limbs, the leaves, the fences, and other objects. This usually happens when rain falls at the close of a period of very cold weather. On the summits of high mountains, notably Mount Washington and the mountain stations of Southern Europe, it frequently happens that although the air is apparently clear, yet it is filled with the most minute drops of water, which are cooled far below the freezing-point, but retain their liquid condition. When these strike any object they lose their spherical shape, and are converted immediately into ice at the temperature of thirty-two degrees. They therefore build up an accumulation of ice on the windward side of every object, giving rise to remarkable displays of so-called 'frostwork.'

Aëronauts have occasionally ascended into and through thin layers of air bearing similar aqueous globules that are cooled below freezing, but still liquid water. These layers appear from a distance like thin stratus clouds, but are scarcely perceptible when viewed directly from below on account of their transparency. The globules instantly change to snowflakes or frostwork when they strike any object.

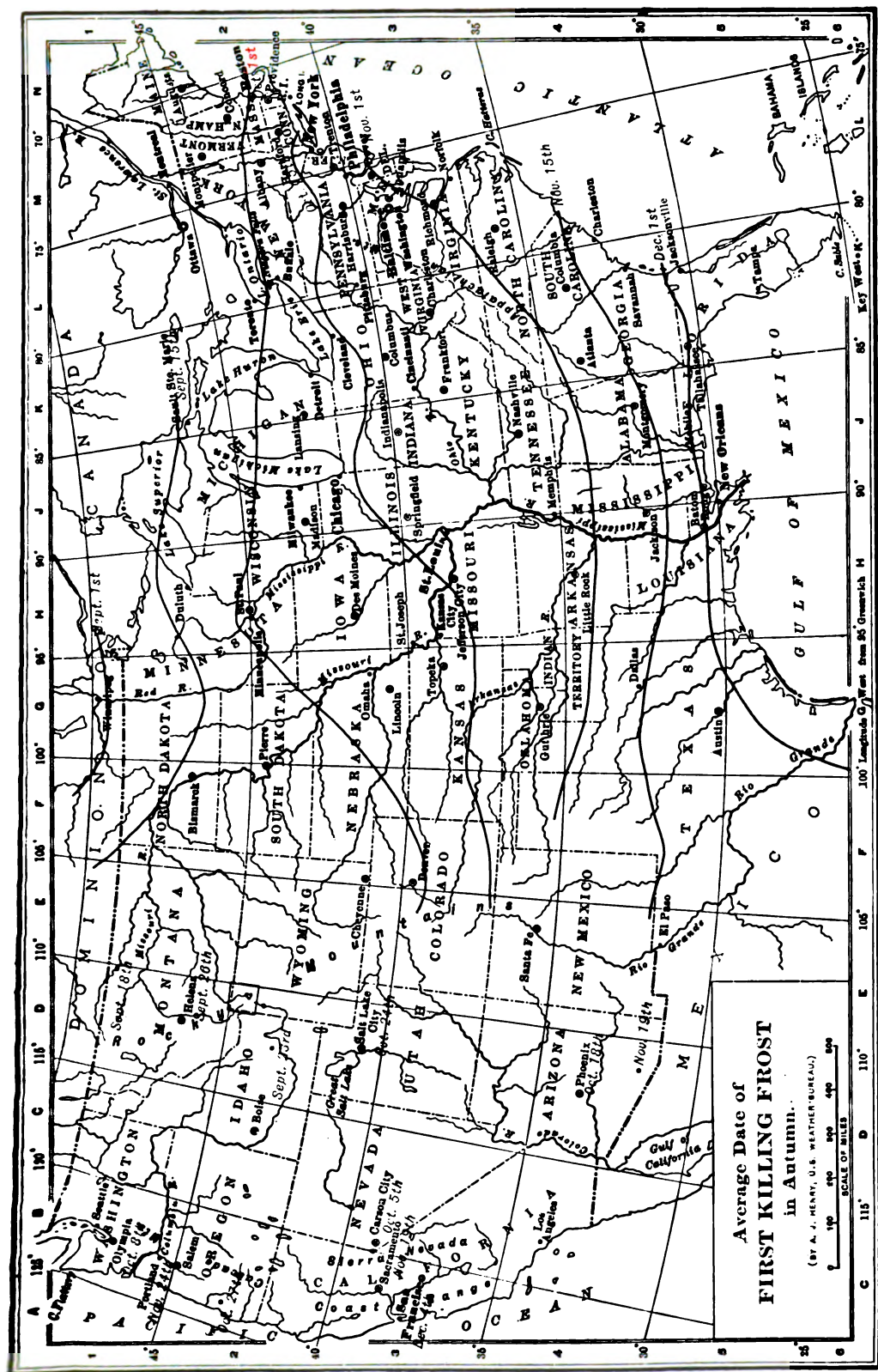
Tender vegetables in northern gardens and tropical plants in the southern portion of the United States and in California are severely injured or

killed by freezing temperatures. The mere deposition of frost on the outside of such plants does not necessarily argue that the plant is frozen through and through; it may, therefore, produce only slight damage; on the other hand, when the air is too dry to deposit much moisture, and when it deposits frost only when cooled greatly below 32° Fahrenheit, it often happens that the plants are frozen under a clear sky or during a cold, dry wind without the deposition of much, if any, frost upon their exterior surfaces; in such cases the sap within the cells and especially within the medullary rays is frozen; the structure of the plant is destroyed, and when the sun's warmth has melted the frozen sap, the leaves and stalks sink to the ground, wilt away, and turn black, being in fact dead. This phenomenon is known as the black frost. It is, however, more properly a freeze than a frost.

The interval between the last frost of spring and the first frost of autumn is the so-called growing season of the agriculturists. Between these dates tender plants of all kinds must perfect their crops, while those that can withstand frosts continue their growth uninterruptedly. Especially must the great staple crops of the country—the Indian corn or maize, the cotton, tobacco, and a large range of tender fruits, as well as spring wheat, rye, and buckwheat—all complete their growth between these dates. The accompanying maps show by curved lines the regions in the United States over which the first and last frosts occurred on given dates on the average of the past thirty years. A comparison of these maps will therefore show the length of time that is available as a normal growing season in any part of the country. Although agriculturists always select seed that is likely to produce a quick-growing crop that may be harvested before the early frost of autumn, yet, owing to the irregularities of climate, the late spring frosts and the early autumn frosts frequently bring their crops into jeopardy. This has stimulated the invention of many methods of frost protection, which are fully described in the *Monthly Weather Review* for the years 1894-97, and especially in *Bulletins on Frost Protection*, Nos. 23 and 29, issued by the Weather Bureau.

The methods of frost protection are divided into several categories, as follows: (1) A light screen of any material, even a few slats or a gauzy veil, stretched above a plant prevents the radiation of the plant's heat into space, and by reflecting back the heat from the soil may keep the temperature of the plant so high as to prevent frosty temperatures. (2) Fires with clouds of smoke warm the air of a field while the smoke cloud prevents radiation; in perfectly still air such a cloud of smoke will spread evenly in all directions, and continue effective through the night. (3) Without reliance upon a cloud of smoke, one may warm the ground and the air either by fires, or by streams of water, or by flooding the field. All these methods and various combinations of them are in regular use for the protection of tropical fruits in California and Florida, and for the protection of tobacco, cranberries, and early vegetables in Northern States. Many patented devices for making smudges are on the market, but in general the smudge disfigures the fruit, and other protective devices are preferred.

Although the tender portions of plants are



destroyed by frost, yet the ripened mature seed is much less susceptible. The kernels of both corn and wheat may be subjected to very low temperatures without being injured. Unfortunately, many of the bacterial germs and fungoid spores also are not injured by cold. It was formerly supposed that freezing weather destroyed the germs of malarial and yellow fever; but it is now probable that such germs are not affected by cold, but that, on the other hand, the cold checks the mosquitoes and other insects by which these germs are introduced into the human body.

The prediction of frost is a matter of great importance to a farmer, and can usually be made with great exactness by the help of the daily weather map, wherefore special attention is paid to this subject by the officials of the Weather Bureau. All persons whose interests depend largely upon the knowledge of frost keep in close touch with the Weather Bureau, and receive special telegrams when freezing temperatures are approaching. In general, when the dew-point is below 32° F. and the night is still and clear, the temperature will fall rapidly, and it may reach the freezing-point before sunrise.

Inasmuch as severe frosts have sometimes been very destructive to the staple crops, they have occasionally been the direct cause of severe famines; lists of memorable frosts for the last four hundred years will be found in Andrews, *Famous Frosts and Frost-Fairs in Great Britain* (London, 1887); also Walford, paper on "Famines" in *Journal of the Statistical Society* (London, 1878). The record for the United States will be found most conveniently in Pierce on *The Weather* (Philadelphia, 1860), and in the successive numbers of the *Monthly Weather Review* (Washington).

A special and elegant form of frostwork occurs as 'ice needles' or 'ice columns,' that rise up in masses from gravelly ground, raising up the top layer of gravel and small stones on their summits to a height of two, four, or six inches. These ice columns are hollow, and are apparently formed by the freezing of the films of moisture that rise up from the lower warm wet soil and freeze on the under side of the top layer of stones when the latter are chilled by radiation during clear nights. These columns do not form when the air is cold enough to freeze the soil below the top layers. A similar formation exudes from a thin crack in the bark of a tree when the warm body of the tree affords sap enough. The mechanics of this process is partially explained by Prof. Cleveland Abbe in the *American Meteorological Journal* for April (1893).

FROST, ARTHUR BURDETT (1851—). An American caricaturist and illustrator. He was born at Philadelphia, January 19, 1851. At fifteen years of age he was for six months in an engraver's employ. He became a lithographer, and afterwards studied in the Philadelphia Academy of Fine Arts under Thomas Eakins. Subsequently he worked for the *New York Graphic*. In 1876 he entered the studio of Harper & Brothers, and was associated with Abbey, Reinhart, and Alexander. In 1877-78 he worked in England. Frost's works show thorough draughtsmanship. Honesty is the principal characteristic of the artist. He draws all the elements that compose the picture with equal interest and sympathy.

His first illustrations for a volume, entitled *Out of the Hurly-Burly*, attracted much notice. Other important illustrations are found in Stockton, *Rudder Grange* (1879); Octave Thanet, *Stories of a Western Town* (1893); Bunner, *Stories of a New York House* (1887). Publications of his own are: *Stuff and Nonsense* (1888); *Bull Calf, and Other Tales* (1892); *Golfer's Alphabet; Sports and Games in the Open*.

FROST, JACK. See JACK FROST.

FROST, JOHN (1800-59). An American compiler. He was born in Kennebunk, Maine; graduated at Harvard, and taught in Boston and Philadelphia. He published a great number of works, comprising school and juvenile books, and historical and biographical compilations, among which may be mentioned: *Pictorial History of the United States* (2 vols., 1844), which was exceedingly popular; *Picture History of the World; Lives of American Generals; and Lives of American Naval Commanders*.

FROST, PERCIVAL (1817-98). An English mathematician, born at Hull. He attended school at Beverley and Oakham, and in 1835 entered Saint John's College, Cambridge. Although as a boy he showed great aptitude for classics, at Cambridge he devoted his attention chiefly to mathematics. He was made a fellow of Saint John's in 1839, and on his marriage in 1841 he became tutor in mathematics, among his pupils being, somewhat later, W. K. Clifford. He held a mathematical lectureship at Jesus College for twelve years, and afterwards at King's College for thirty years, becoming Fellow of King's and taking his degree of Sc.D. (Camb.) in 1882. His chief works were *A Treatise on the Principia* (1854); *A Treatise on Solid Geometry* (with Wolstenholme, 1863); and *A Treatise on Curve-Tracing* (1872). Consult Taylor's biographical note in the *Proceedings of the London Mathematical Society*, vol. xxix. (London, 1898).

FROST, WILLIAM EDWARD (1810-77). An English painter. He was born at Wandsworth in September, 1810, and studied at the Royal Academy. At first he painted portraits; but, under the influence of Etty, devoted himself to mythological subjects. In 1839, he exhibited "Prometheus Bound," for which he received the Academy's gold medal. In 1847 he won a competition prize by his cartoon, "Una Alarmed by the Fauns." Among his works are the "Bacchanalian Revel" and "Disarming of Cupid" (1850), in the King's possession; "Narcissus" (1857); "Hylas and the Nymphs" (1867); and "Masidora" (1871). He died in London, June 4, 1877.

FROST-BIRD, or FROST-SNIPE. An American gunner's name for the stilt sandpiper (*Micropalama himantopus*). See STILT; and Plate of BEACH-BIRDS.

FROSTBITE. A term usually applied to local effects of cold, although it may be properly used to designate all results of low degrees of temperature, from chapped hands to freezing to death (*asphyxia congelatorum*). The frostbitten part is at first pale, cold, tingling, and numb; then strong, stiff, with loss of sensation and motion; later, shrunken, hard, even brittle, livid and mottled from coagulation of blood in the veins. Molecular death occurs, the blood-corpuscles disintegrate, sloughing and mortification

result, and a line of demarcation is established. (See GANGRENE.) Although a sudden violent application of cold may cause death of the tissues by reducing the temperature to a degree incompatible with animal life, the most common cause of the destructive effects of moderate frostbite is perhaps the excessive reaction which occurs on sudden removal of the cold, or the application of heat; this is especially the case with moist cold.

Most cases of frostbite are very trifling, the most common being chilblains. (See CHAPPED HANDS and CHILBLAINS.) The treatment of frostbite is most prudently effected by friction, at first with snow, then with ice-water, and then with water at ordinary temperature, no warmth being applied for some time. If the frozen part is brittle, spraying with ice-water must be substituted for rubbing with snow. As the coldness subsides, the painful tingling and then redness and heat return; in a short time the heat is above the normal, and a febrile reaction sets in. Partial recovery may always be expected unless the freezing has been continued too long. When sloughing begins it is necessary to employ supportive and stimulative treatment, with hot fomentations, turpentine dressings, carbolized-oil applications, etc., as adjuvants. After the line of demarcation is established, amputation should be performed by a surgeon. Eczema and pruritus may follow moderate frostbite. Partial paralysis of the parts supplied by the facial and radial nerves, or even hemiplegia, may follow. The use of alcoholic drinks when exposed to cold is a fatal mistake. The drug brings heat to the surface of the body, where it is rapidly lost, and the vitality of the individual is lowered. Alcoholism contributes forcibly to a fatal result in comparatively mild frostbite, from which temperate persons would quickly recover.

FROSTBURG. A town in Allegany County, Md., 163 miles southeast of Pittsburg, Pa.: on the Cumberland and Pennsylvania Railroad (Map: Maryland, B 2). It is picturesquely situated at an elevation of about 2200 feet, and is a summer resort. It is the seat of a State normal school. Frostburg has large fire-brick works, planing-mills, foundries, etc., but is engaged chiefly in coal-mining. The government is administered under a charter of 1870, which provides for a mayor, chosen annually, and a city council elected at large. The water-works are owned and operated by the municipality. Population, in 1890, 3804; in 1900, 5274.

FROSTFISH. (1) A slender, scaleless, pelagic fish (*Lepidotus caudatus*), elsewhere known as scabbard-fish, but called frothfish in New Zealand, where it visits the coast to spawn at irregular intervals, and is much sought after as a delicacy by a strange method of capture. It has the extraordinary habit, in winter, of coming ashore alive on certain sandy beaches, where it wriggles on to the firmer sands above the surf-line, there to die or be quietly devoured by some animal. No satisfactory reason has yet been assigned for this suicidal proceeding, but it is taken advantage of by the 'fisherman.' When the night is clear and calm, with comparatively low surf, as well as frosty, the fish may be expected: and then parties of men go to the beach shortly before daybreak (or perhaps

camp there overnight and rise early), and walk back and forth, seizing the fish as they come floundering out of the surf and killing them.

(2) In New England, a tomcod (q.v.).

FROTH-FLY, FROTH-HOPPER, FROG-FLY, or FROGHOPPER. Insects of which the young—larvæ and pupæ—are found in a frothy exudation on plants. They form the family Cero-copidæ of homopterous bugs, and are allied to aphids, and still more nearly to cicadas and lantern-flies. The larvæ and pupæ differ little in appearance from the perfect insect, except that the latter possesses four large wings. The froth, commonly called frog-spittle, is believed to be composed of sap which the insect sucks up through its proboscis. The sap passes through the intestine and is emitted as a clear mass, into which the insect draws bubbles of air by means of its tail claspers, and thus makes foam. When the insect is about to transform, the foam dries in such a way as to produce a shelter for the ensuing quiescent stage. The most common one in the Eastern United States is *Aphrophora quadrangularis*. Some of the tropical forms assume very bizarre shapes, caused by outgrowths from the thorax. The fluid is emitted by some species in drops which may be thrown a considerable distance, causing the phenomenon known as weeping trees. A few dozen larvæ of a Madagascar form may exude a quart of fluid in an hour and a half. Frog-spittle is supposed to be produced as a protective covering for the young insect, but in spite of it certain Hymenoptera pick the larvæ out and carry them off to be stored as food for their larvæ. The winged stage is a much flattened one and capable of long leaps, whence the name 'froghopper,' first given to them because they came from the 'frog-spittle,' is doubly appropriate.

FROTHINGHAM, frôth'ing-am, ARTHUR LINCOLN (1859—). An American archaeologist and educator, born in Boston, Mass. He studied at the Catholic Seminary of San Apollinare, Rome, Italy; the Royal University of Rome, and the University of Leipzig (Ph.D., 1883); was fellow in Semitic languages and lecturer in archæology at the Johns Hopkins University in 1882-86; in 1887 was appointed to the Princeton chair of archæology and the history of art, and in 1898 became professor of archæology and ancient history. In 1884 he was secretary of the Archæological Institute of America; in 1885 founded *The American Journal of Archaeology*, of which he was owner and editor until 1896; and in 1895-96 was an associate director of the American School of Classical Studies at Rome. His publications include contributions to periodicals, monographs on sculpture and painting: *Stephen Bar Sudaili, the Syrian Mystic and the Book of Microtheos* (1886); and (with A. Marquand) *A Text-Book of the History of Sculpture* (1896). He prepared articles on architecture for *The New International Encyclopedia*.

FROTHINGHAM, ELLEN (1835-1902). An American translator, the daughter of Nathaniel Frothingham. She was born in Boston. She made a special study of German literature, and is well known for her translations into English of Lessing's *Nathan der Weise* (1868); Goethe's *Hermann und Dorothea* (1870); Auerbach's *Edelweiss* (1871); and Lessing's *Laokoon* (1874),

FROTHINGHAM, NATHANIEL LANGDON (1793-1870). An American clergyman and writer. He was born in Boston, and graduated at Harvard in 1812, where he subsequently became the first professor of rhetoric and oratory. In 1815 he was ordained pastor of the First Church (Unitarian), in Boston, which position he occupied until 1850, when he left the pulpit, and devoted himself to literature. He published: *Sermons in the Order of a Twelvemonth* (1852), and *Metrical Pieces, Translated and Original* (1855). He also contributed largely to periodical literature, and was a thorough student of German, when such scholarship was rare in America. His biography was written by his son, Octavius Brooks Frothingham.

FROTHINGHAM, OCTAVIUS BROOKS (1822-95). An American Unitarian clergyman. He was born in Boston, November 26, 1822, a son of Rev. Nathaniel Langdon Frothingham. He was graduated at Harvard College in 1843, at the Cambridge Divinity School in 1846, and was settled as pastor of the North Church (Unitarian), Salem, Mass., in 1847. In 1855 he became minister of a church in Jersey City, N. J., where he remained four years. In 1859 he accepted a call to the pastorate of the newly formed Third Unitarian Congregational Church in New York, and remained at that post for twenty years, when ill health compelled his resignation. From the beginning he belonged to the most radical wing of the Unitarians, and the name of his church was finally changed from the 'Third Unitarian' to the 'First Independent Liberal Church of New York,' the connection with the Unitarian denomination being thereby sundered. After 1881 he resided in Boston, and devoted himself to literary work. He died November 27, 1895. Frothingham was one of the founders of the 'Free Religious Association,' and its president for the first twelve years of its existence. He ranked high as a scholar, and as a preacher was impressive and eloquent. He contributed largely to the periodical press, on a great variety of subjects, and published more than two hundred sermons. Other works worthy of mention are: A translation of Renan's *Studies of Religious History and Criticism* (1864); *History of Transcendentalism in New England* (1876); *History of Boston Unitarianism from 1820 to 1850*, including a memoir of his father (1890); and lives of Theodore Parker (1874), Gerrit Smith (1878), George Ripley (1882), William Henry Channing (1886), and David Atwood Wasson (1889).

FROTHINGHAM, RICHARD (1812-80). An American journalist and historical writer, born in Charlestown, Mass. He was a member of the State Legislature in 1839, 1840, 1842, 1849, and 1850; was Mayor of Charlestown in 1851-53; was a delegate to the National Democratic Conventions of 1851, 1852, and 1876; and from 1852 to 1865 was managing editor of the *Boston Post*, of which he was also for many years a proprietor. He devoted much of his time to historical study, and published, in addition to pamphlets and magazine articles, a *History of Charlestown* (1848); *History of the Siege of Boston* (1849); *Life and Times of Gen. Joseph Warren* (1865); and *The Rise of the Republic of the United States* (1871), his most important work.

FROTTOLA, fröt'tò-là (It., ballad). A kind of Italian folk-song, much cultivated in the six-

teenth century. It was midway between the very simple villanella (q.v.) and the more elaborate madrigal (q.v.). Between 1504 and 1509 Petrucci published nine books of Frottole. The words were generally of an erotic character.

FROUDE, FRÖD, JAMES ANTHONY (1818-94). An English historian, litterateur, and educator. The youngest son of Robert Hurrell Froude (1771-1859), Archdeacon of Totnes, he was born at Dartington, Devonshire, April 23, 1818. He was educated at Westminster School, and at Oriel College, Oxford, where in 1840 he obtained a second-class in classics, and in 1842 graduated B.A., won the Chancellor's Prize for an English essay, and was elected a fellow of Exeter College. He graduated M.A. in 1843, and to retain his fellowship took deacon's orders in 1844, which the Clerical Disabilities Act enabled him to relinquish in 1872. For, influenced by the Tractarian movement, of which his brother Richard Hurrell Froude and Newman were leaders, his views changed, and his early works, *The Shadows of the Clouds* (1847), published under the pen-name of "Zeta," and the *Nemesis of Faith* (1848), being condemned by the University authorities, he resigned his fellowship, also an appointment as head-master of the Hobart High School, Tasmania, abandoned the clerical profession, and devoted himself to historical study and literature. He wrote for the *Westminster Review* and other periodicals, including *Fraser's Magazine*, of which he subsequently became editor, and in 1856 appeared the first volume of *The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada* (12 vols. 1856-1870), on which his fame chiefly rests. In 1869 he was elected rector of Saint Andrews University, and received the degree of LL.D. The preparation and publication of his important historical and biographical works were relieved by intervals of travel and lecture. In 1872 his lectures in the United States on the relations between England and Ireland, in which, arguing from historical parallels, he scoffed at all attempts to conciliate the Irish, involved him in an animated controversy with the Dominican Father Thomas Burke. In 1849 Froude married Charles Kingsley's sister-in-law, Charlotte Maria, fifth daughter of Pascoe Grenfell. She died in 1860, and seventeen months later he married Henrietta Elizabeth, daughter of John Ashley Warre. Upon her death, in 1874, he resigned the editorship of *Fraser's Magazine*, and in 1874, and again in 1875, was sent by the Earl of Carnarvon, Secretary of State for the Colonies, to the Cape of Good Hope to investigate the plan of South African federation. The result of these missions was singularly unfortunate and disastrous to Lord Carnarvon's policy, owing to Froude's tactless speeches and representations. In 1884-85 he visited Australia, and in 1886-87 the West Indies; he wrote accounts of these two visits, which were violently assailed by colonial writers as biased and misleading. As Carlyle's personal friend and literary executor, he edited his *Reminiscences* (2 vols., 1881), Mrs. Carlyle's *Letters and Memorials* (1883), and *Thomas Carlyle: A History* (4 vols., 1882-84), but their copious personal criticism excited much discussion as to Froude's editorial discretion. In 1892 he succeeded Edward A. Freeman (q.v.), one of his most caustic critics, as regius professor of

modern history at Oriel College, Oxford. Froude died at Salcombe, Devon, October 20, 1894. Besides the works already mentioned, his writings include: *The English in Ireland in the Eighteenth Century* (3 vols., 1872-74); *Short Studies on Great Subjects* (2 vols., 1877-82); *Cæsar* (1879); *Two Lectures on South Africa* (1880); *Oceana* (1886); *The English in the West Indies* (1888); *The Two Chiefs of Dunboy* (1889), an historical romance; *Life of Lord Beaconsfield* (1890); *Erasmus* (1894); and *Elizabethan Seamen* (1895). Froude was afflicted with constitutional sentimentality and an unfortunate, if unconscious, facility for inaccurately adapting facts to suit the views he sought to promulgate. His partisan glorification of Henry VIII. as the disinterested and magnanimous executor of the public wish in regard to ecclesiastical reform is one of the most striking examples. Hence the frequent storms of protest and criticism that his writings evoked, and the blemishes of his otherwise splendid works. For, although he at times subordinated accuracy to the exigencies of descriptive, vivid, and emphatic writing, and justified his action on the score of dramatic effect, the lucidity and beauty of his style make his works rank among the finest examples of English prose of the nineteenth century, and have earned for his *magnum opus* an imperishable position in the chronicles of British history. Of Froude there is yet no biography. Consult: the *London Times* for October 22, 1894; the introduction to Wheeler's edition of *Historical and Other Sketches* (New York, 1883); Birrell, in *Scribner's Magazine*, xvii., 149; Goldwin Smith, in *North American Review*, clxi., 677; Stephen, in *National Review*, January, 1901; Godkin, in the *Nation*, liv., 318; and Conway, in same, lix., 378, 401.

FROUFROU, frōō'frōō'. A five-act comedy, the most celebrated work of Meilhac and Halévy, produced at the Gymnase in 1869. The heroine, Gilberte, a high-spirited girl, called Froufrou, is spoiled first by her father, then by her husband, whom she deserts for a lover. She returns at last, is pardoned by her husband, and dies in his house. The play has enjoyed great success.

FROZEN STRAIT. A passage leading northwest from Fox Channel, the northern continuation of Hudson Bay, toward Repulse Bay (Map: Canada, O 3). It separates Southampton Island from Melville Peninsula. It is 15 miles wide, and although in the 66th degree of latitude, is nearly always ice-bound and inaccessible to navigation.

FROZEN WELLS. Wells in which ice is found either with or without water. They occasionally occur in the United States and Europe. A famous one in Brandon, Vt., was sunk through a mass of frozen ground fifteen feet thick, and formerly showed ice at fourteen feet below the surface in the summer time. In most frozen wells the ice lasts until late summer, and the temperature is seldom above the freezing-point. The low temperature and ice were originally attributed to the fact that the well pierces a stratum of glacier drift in which ancient glacier ice still survives, but the researches of Kimball have shown that this extreme hypothesis is quite unnecessary. He has demonstrated that the low temperatures in frozen wells, ice-caves, and similar situations are due to the percolation of cold

air into the interior of the earth during cold winter weather and the coldest hours of the morning. He has shown that the deserted iron-mines at Westport, New York, give a complete key to the method of formation of ice in caves and wells. Consult *United States Monthly Weather Review* (Washington, 1901). See ICE-CAVES.

FRUCTIDOR, fruk'ti-dōr' (Fr., from Lat. *fructus*, fruit, Gk. δῶρον, *dōron*, gift). The twelfth month of the French Republican calendar. It ran from August 18th to September 16th in the years I.-VII. and from August 19th to September 17th in the years VIII.-XIII., being followed by five supplementary days, known as *sans-culottides*, which filled out the year. The 18th Fructidor, Year V. (September 4, 1797), is celebrated as the day on which Barras, Rewbell, and La Révellière, members of the Directory, by a coup d'état, expelled their colleagues Carnot and Barthélemy, and saved the Republic from the machinations of the party of reaction, who had obtained the upper hand in the Council of Five Hundred. See FRENCH REVOLUTION.

FRUCTOSE. See SUGARS.

FRUGAL, LUKE. The villain of the two brothers whose temperaments are contrasted in Massinger's *City Madam*. His brother John's generosity is set over against his hypocrisy, much as Sheridan contrasts the brothers Surface.

FRUGONI, frōō-gō'nē, CARLO INNOCENZIO MARIA (1692-1768). An Italian poet of the Arcadian coterie, remarkable mainly for his power of improvisation, in virtue of which he was one of the most indefatigable writers of occasional verse in his time. Born at Genoa, November 21, 1692, he became a cleric, a teacher of rhetoric in various places in Italy, and poet laureate at the Court of Parma. He seems to have taken monastic vows rather under compulsion than of his own accord, and he found them so irksome that Pope Clement XII., at the instance of Cardinal Bentivoglio, had him released from the rigid obligations of life in the cloister, though, of course, not from his sacerdotal duties.

Frugoni represents the third rhyming manner of the Arcadian Academy, a school of Italian writers, which was founded in 1692, and whose activity ended with our author. He had some success in the pastoral song, but after all he remains noteworthy chiefly as an exceedingly facile improviser, who also possessed a very lively fancy. Consult: his *Opere poetiche* (10 vols., Parma, 1779), which contains his *Memorie storiche e letterarie*; the *Poesie dell' abate C. I. Frugoni* (15 vols., Lucca, 1779-80), the most nearly complete edition; a good selection from his verse in Carducci, *Poeti erotici del sec. XVIII.* (Florence, 1878); some *Lettere inedite*, published by Bertoldi (Forlì, 1891), and others published by Mazzatinti (ib., 1892); the biography in Fabroni, *Vita*, vol. i. (1778-1805); Torelli, "C. I. Frugoni," in his *Pasaggi e profili* (Florence, 1861).

FRUIN, froin, ROBERT (1823-99). A Dutch historian, born in Rotterdam. He was educated at Leyden, where he was appointed professor of the history of the Netherlands in 1860. He was editor of the *Nijhoff's Bijdragen voor Vaderlandsche Geschiedenis*, and was a frequent contributor to *De Gids*, and other publications. He

was regarded as the greatest living authority on Dutch history, and his work entitled *Tien jaren uit den tachtigjarigen oorlog* (4th ed. 1889) is considered one of the best historical works of modern times. His *Reply to Sir Bartle Frere*, and an *Appeal to the People of England* (1881) relative to the Transvaal question, created considerable comment. Another of his publications is *Geschiedenis der staatsinstellingen in Nederland tot den val der republiek* (1901). His *Uerspreide Geschriften* were published by Block. P. L. Müller, and S. Müller in 1900.

FRUIT (OF., Fr. *fruit*, Lat. *fructus*, fruit, from *fruit*, to enjoy). The structure that ripens in connection with the seeds in the spermatophytes (seed-plants). In popular application the term is also used in connection with the sporogonium of mosses, and the sori of ferns (q.v.); but it is misapplied in these senses. The structures of seed-plants included in the fruit are exceedingly variable. In typical cases the fruit is the ripened ovary, as in ordinary pods, the transformed wall being called the pericarp; in apples it includes floral structures outside of the ovary; in strawberries it consists in the main of a very much enlarged receptacle; while in pineapples it is the whole inflorescence. So variable are fruits in structure that it is difficult to classify them satisfactorily, and it is not profitable to give a complete list of the numerous and often pedantic terms which have been applied to them. It will be sufficient to describe the principal forms. It seems to be most convenient to divide fruits into two great divisions, Dry Fruits and Fleshy Fruits.

DRY FRUITS. Dry fruits either open (dehiscent) in various ways to discharge their seeds, or they contain but a single seed, which accompanies the fruit in the dispersal. The dry fruits, therefore, naturally fall into two groups: (1) those which are dehiscent, and (2) those which are indehiscent. Such fruits also consist of the ripened ovary, and therefore have a strict morphological boundary. (1) *Dehiscent fruits* have received the general name of 'pods,' and are grouped on the basis of the number of carpels they contain and the method of dehiscence. The prominent forms are as follows: *Follicle*, a pod consisting of a single carpel, and dehiscing by splitting down the inner side, as in the peony. *Legume*, a pod consisting of a single carpel, and dehiscing by splitting down both sides into two pieces or valves, as in the common pea and bean. Very frequently legumes are simply spoken of as pods, and they are so characteristic of the great pea family that it has been called the Leguminosæ. *Capsule*, a pod consisting of more than one carpel, and dehiscing variously. The dehiscence is said to be septicial when the carpels separate from one another, and in such case each carpel may split down the inner face as if it were a follicle, as in the genus *Hypericum*. In other cases the carpels do not separate, but each one splits down the back, such dehiscence being called loculicidal, as in iris, evening primrose (*Enothera*), etc. In still other cases there are no slits of dehiscence, but the seeds are discharged through pore-like openings near the summit of the capsule, as in the common poppy. *Silique*, the peculiar pod of the mustard family (*Cruciferae*), which consists of two carpels, and is divided into two chambers by a false parti-

tion, to which the seeds are attached. In dehiscence the two carpels split away as two valves from the membranous partition, which is thus exposed with its attached seeds. *Silicle*, a short silique, which is little if at all longer than broad, as in the common shepherd's-purse (*Capsella*), *Pyxis*, a pod which opens by means of a cap-like lid, as in twinleaf (*Jeffersonia*).

(2) *Indehiscent fruits* mature but a single seed, although they are often derived from an ovary composed of more than one carpel, and the pericarp so closely invests the seed that such fruits are popularly spoken of as seeds. Common illustrations are as follows: *Achene*, or *Akene*, the most common seed-like fruit, characteristic of the great family Compositæ, to which belong the sunflowers, thistles, dandelions, etc. In this family the achene commonly bears at its summit the modified calyx (pappus), which in the form of a tuft of hairs or plumes, bristles, hooks, etc., aids in dispersal by wind or animals. *Caryopsis*, or *Grain*, the peculiar seed-like fruit of the grasses, as maize, wheat, barley, rice, etc. *Nut*, a dry indehiscent fruit, in which the pericarp becomes very hard and bony, as in the acorn, chestnut, beechnut, etc. Very commonly there is associated with the nut a peculiar involucre, as that which forms the cup of the acorn and the characteristic investment of chestnuts and beechnuts.

FLESHY FRUITS. Fleshy fruits are indehiscent, since the flesh is intimately associated with the seeds in their dispersal. It is these fruits which are so variable on account of the different structures which ripen. The most common forms are as follows: *Berry*, a fleshy fruit, which is pulpy throughout, and which has a thin skin, or rind. In this case the fruit is a ripened ovary, and common examples are the grape, currant, gooseberry, tomato, etc. *Hesperidium*, a berry with a leathery rind, as the orange and lemon. *Pepo*, a pulpy fruit with a hard rind, as the pumpkin, squash, melon, and the whole race of gourds. *Drupe* or *Stone-fruit*, in which the pericarp ripens in two layers, an outer pulpy one, and an inner stony one, as the peach, plum, cherry, etc. In these cases the pit or stone is often spoken of as the seed, but it invests the seed, which is the kernel. *Drupelet*, a small drupe, as the individual grains of raspberry, blackberry, mulberry, etc. Drupelets are usually aggregated to form a single fruit, as in the illustrations cited. In the raspberry the fruit is simply an aggregation of drupelets; while in the blackberry and mulberry there is associated with the aggregation of drupelets a fleshy axis. *Pome*, a fleshy fruit in which the pulp is the ripened urn-like outgrowth which surrounds the carpels and bears the sepals, petals, and stamens on its rim. Common illustrations are apple, pear, quince, hawthorne, etc. In these cases the modified ovary is the so-called core.

While this classification is fairly complete, it does not include some of the most familiar fruits. For example, the strawberry is a fruit which consists of a very much enlarged and fleshy receptacle, in which are imbedded numerous minute achenes (pits). The banana is a fleshy fruit, but it dehisces by the pericarp splitting into valves, and hence it is often called a fleshy capsule, which is really a contradiction of terms. Almonds are dry fruits, but they are constructed

exactly like the peach, except that the pulpy layer of the pericarp in the peach is a fibrous layer in the almond. The almonds of the markets correspond to the stone of the peach, being the hard inner layer of the pericarp, investing the seed or edible kernel. The pineapple is a whole inflorescence, in which axis, bracts, flowers, and all have become a mass of luscious pulp.

FRUITS, FOOD VALUE OF. Fruits are eaten fresh, both raw and cooked, dried or evaporated, canned and preserved. They are frequently divided into a number of classes, the edible fruits being mostly pomes, e.g. apple, pear, etc.; stone-fruit, e.g. cherry, plum, etc.; berries, e.g. blueberry, grape, banana, etc.; aggregate fruits, e.g. strawberry, raspberry, pineapple, etc.; hesperidium, e.g. orange, grapefruit, lemon, etc.; syconium, e.g. fig. A large class of edible fruits, such as tomatoes and melons, are more commonly spoken of as vegetables (q.v.), and another as nuts (q.v.). The following table gives the composition of the more common fresh fruits, as well as of a number of dried or evaporated, and canned or preserved fruits:

COMPOSITION OF EDIBLE PORTION OF FRUITS; FRESH, DRIED, AND PRESERVED

FRUITS	Water	Protein	Fat	Carbohy- drates	Ash	Fuel value per pound
FRESH	Per cent.	Per cent.	Percent.	Per cent.	Percent.	Calories
Alligator pear.....	81.1	1.0	10.2	6.8	0.9	512
Apple.....	84.6	.4	.5	14.2	.3	290
Apricot.....	85.0	1.1	.....	13.4	.5	270
Banana.....	75.3	1.3	.6	22.0	.8	460
Blackberry.....	86.3	1.3	1.0	10.9	.5	270
Cherry.....	80.9	1.0	.8	16.7	.6	365
Cranberry.....	88.9	.4	.6	9.9	.2	215
Currant.....	85.0	1.5	.....	12.8	.7	265
Fig.....	79.1	1.5	.....	18.8	.5	380
Grape.....	77.4	1.3	1.6	19.2	.5	450
Huckleberry.....	81.9	.6	.6	16.6	.3	345
Lemon.....	89.3	1.0	.7	8.5	.5	206
Nectarine.....	82.9	.6	.....	15.9	.6	306
Orange.....	86.9	.8	.2	11.6	.5	240
Pear.....	84.4	.6	.5	14.1	.4	295
Persimmon.....	66.1	.8	.7	31.5	.9	630
Pineapple.....	89.3	.4	.3	9.7	.3	200
Plum.....	78.4	1.0	.....	20.1	.5	395
Pomegranate.....	76.8	1.5	1.6	19.5	.6	460
Prune.....	79.6	.9	.....	18.9	.6	370
Raspberry, red.....	85.8	1.0	.....	12.6	.6	255
Raspberry, black.....	84.1	1.7	1.0	12.6	.6	310
Strawberry.....	90.4	1.0	.6	7.4	.6	180
Whortleberry.....	82.4	.7	3.0	13.5	.4	390
DRIED						
Apple.....	28.1	1.6	2.2	66.1	2.0	1,350
Apricot.....	29.4	4.7	1.0	62.5	2.4	1,290
Citron.....	19.0	.5	1.5	78.1	.9	1,625
Currant, Zante.....	17.2	2.4	1.7	74.2	4.5	1,495
Date.....	15.4	2.1	2.8	78.4	1.3	1,615
Fig.....	18.8	4.3	.3	74.2	2.4	1,475
Pear.....	16.5	2.8	5.4	72.9	2.4	1,635
Prune.....	22.3	2.1	.....	73.3	2.3	1,400
Raisin.....	14.6	2.6	3.3	76.1	3.4	1,805
Raspberry.....	8.1	7.3	1.8	80.2	2.6	1,706
PRESERVED						
Apple, Crab.....	42.4	.3	2.4	54.4	.5	1,120
Apricot sauce.....	45.2	1.9	1.3	48.8	2.8	1,000
Blackberry.....	40.0	.8	2.1	56.4	.7	1,150
Peach.....	68.1	.7	.1	10.8	.3	220
Pineapple.....	61.8	.4	.7	36.4	.7	715

These figures represent average values; individual specimens will vary greatly from the average. Many fruits contain more or less inedible material or refuse, such as stems, seeds, pit, etc., while others are entirely edible. The inedible portion may be considerable; thus, in oranges the skin and seeds amount to about 27 per cent. In bananas the skin constitutes about 35 per cent. of the fruit as purchased.

On the other hand, the inedible portion may be very small. Thus the pits of cherries or the hulls of strawberries constitute about 5 per cent. of the weight of the fruit. It will be seen in general that fruits have a high water content. Carbohydrates, which include starches, sugars, and similar bodies, make up the principal nutritive material. In general, fruits contain very little protein or fat. An exception is the alligator pear, which contains about ten per cent. of fat. The ash content of fruits is also small. The ash is made up of salts of calcium, potassium, magnesium, sodium, etc. For instance, the ash of one sample of cherries, which constitutes about 0.6 per cent. of the total fruit, contained 4.2 per cent. of calcium oxide, 57.7 of potassium oxide, 5.5 of magnesium oxide, 15.1 of phosphoric acid, 6.8 of sodium oxide, and 5.8 of sulphuric acid. The ash of three samples of figs (also constituting some 0.6 per cent. of the total fruit) contained an average of 2.4 per cent. of calcium oxide, 55.8 of potassium oxide, 5.6 of magnesium oxide, 12.4 of phosphoric acid, and 3.9 per cent. of sulphuric acid. In the ash of

five samples of grapes (which makes up 0.5 per cent. of the fruit) there was an average percentage of 5 calcium oxide, 50.9 potassium oxide, 3 magnesium oxide, 21.2 phosphoric acid, and 4.3 sulphuric acid.

Dried or evaporated fruits contain much more nutritive material in proportion to their bulk than do the fresh fruits, owing to the fact that, like other dried fruits, they have been concen-

trated by evaporation. Canned or preserved fruits are, generally speaking, cooked fruits, with or without the addition of sugar. Fruits owe their flavors to the presence of esters, acids, volatile oils, salts, and other chemical bodies. The coloring is due to the presence of erythophyll and other complicated chemical compounds. In food analysis such materials are not estimated separately. The total amount is not large, and such bodies are generally included under the carbohydrates, or, as the group is frequently termed, the nitrogen-free extract. The flavor, appearance, and composition of fruits may be modified by cultivation.

Little is known of the digestibility of fruits, that is, the amount of material which they give up to the body in their passage through the digestive tract. It seems fair to assume that they are quite thoroughly assimilated. Over-indulgence in fruit and the consumption of unripe fruit or of that which is more or less decayed, frequently causes pain or other unpleasant symptoms, and there are persons who, because of personal idiosyncrasy, cannot eat certain fruits without distress. Judging by the results of a large number of dietary studies made in the United States, it appears that fruits furnish 5.0 per cent. of the total carbohydrates and about 1 per cent. of the total food, and 4.9 per cent. of the total protein and fat taken together. In many dietary studies which have been made the cost of foods has been recorded. It has been found that a large consumption of fruits or fresh vegetables, owing to their low food content, increases the cost of the diet out of proportion to the nutritive material furnished.

It must not be forgotten, however, that fruits have value in addition to their nutrient value. They contain salts, acids, and other bodies which are believed by physiologists to have a beneficial effect on the system, and doubtless very often stimulate the appetite for other food. They are also useful in counteracting a tendency to constipation. Another point—and one entirely apart from food value—should not be overlooked. That is, fruits add very materially to the attractiveness of the diet. It is not easy to estimate their value from this standpoint, since often the appearance of food has a value which cannot be measured in dollars and cents. For bibliography, see separate articles on various kinds of fruits.

FRUIT, CULTIVATED. Cultivated fruits exhibit great diversity of form, color, texture, flavor, and keeping quality. All are intimately associated with the flower which precedes their formation, and all find their chief use as food for man. The plants that produce them are adapted to great diversity of climate and soil, and may be divided into three main groups—tropical, subtropical, and temperate—depending upon the temperature they require for their perfect development. The leading fruits of the tropics are date, banana, cocoanut, and pineapple; of the subtropics, orange, lemon, fig, pomelo; of the temperate, apple, grape, plum, olive, peach, pear, cherry, strawberry. All of these contribute largely, not only to the diet of the resident populace, but through export, in either the fresh or the preserved state, to the prosperity of the region in which they grow.

The present commercial importance of cultivated fruits is largely due to the developments of

the latter half of the nineteenth century. Prior to that period few fresh fruits other than apples, lemons, oranges, and cocoanuts, and such dried fruits as figs, raisins, and prunes, could be obtained for more than a few consecutive weeks in the general markets of the world, their perishable nature precluding long shipment and exposure previous to sale. During that period the great advances made in quick transportation by sea as well as by land, and the remarkable improvements wrought in methods of canning and evaporating and in holding fresh fruits in edible condition by means of cold storage, have had a wider influence in extending the area devoted to cultivated fruits than improvements in the fruits themselves or in the methods of cultivation. Improved methods of preservation and expeditious transportation have enabled fruit-growers throughout the world to educate the taste and create a demand for fruits in remote regions, with the result that the number of cultivated and even of important wild edible fruits not found either fresh or preserved in the world's principal markets is small indeed, and is becoming steadily smaller. America and Australia ship apples to Europe, which reciprocates by exporting figs, raisins, and the seedless grapes known in commerce as 'currants'; California sends grapes and raisins, citrus fruits, fresh and canned peaches, pears, cherries, and apricots to the States east of the Rocky Mountains; the States bordering the Gulf of Mexico send strawberries, peaches, and other perishable fruits to the North before the Northern season opens; the tropics export bananas, cocoanuts, and pineapples to markets in the temperate zones. Apples, lemons, bananas, and oranges may now be obtained in a fresh state throughout the year, and many other fruits, such as pears, strawberries, grapes, and peaches, that could be obtained for only a few weeks, have had their seasons extended in some instances to as many months. Fruit, fresh or preserved, domestic or exotic, is so generally included in the daily diet of the people of all civilized countries, and the extension of plantations in every country visited by commerce is so active, that the world may be said to be in its fruit age.

If the standing of fruits be determined by the area devoted to each, the consumption of each, and the variety of fruit products of each; the order of sequence in a list of the world's cultivated fruits and their products would probably not vary greatly in a series of years from the following: Apple (evaporated, butter, marmalade, jelly, cider, vinegar, wine, champagne, brandy); grape (wine, vinegar, jelly, argols, or dried as raisins or currants); olive (pickled, oil); lemon; orange (cider, marmalade, candied); cocoanut (dried, oil); banana; peach (canned and dried); plum (canned or dried as prunes); pear (canned, perry); date (dried); fig (dried); strawberry (canned); pineapple (canned); cherry (canned, dried, and candied). If commercial standards, quantity and variety of product, and quick precision in applying scientific discovery and business acumen to fruit-growing and marketing, be employed to determine the standing of a country with respect to its cultivated fruits, the United States stands without a peer; and among the continents, North America ranks first. Immigrants from Europe, who brought with them the

fruits of the fatherland, found the land of their adoption to be rich in new kinds of fruits. The dual list begun by them has been swollen by importations from other regions—Asian, African, Australian, and South American—and now far exceeds in number of species that of any other country. All the fruits of the northern temperate zone, many of the southern and the subtropical, and a few peculiarly tropical may be found in some region of the United States. Europe contributed the apple, pear, and cherry; Asia, the peach, plum, orange, fig, and cocoanut; Africa, the date; South America the navel orange, and so on. America has developed many varieties of the following indigenous fruits which she offers in exchange; e.g. blackberry, raspberry, cranberry, dewberry, grapes, and some gooseberries, plums, and apples, besides innumerable improvements in species already highly developed abroad. Yet she has scarcely made more than a beginning; many fruits, such as the persimmon, papaw, buffalo berry, and prickly pear, have as yet attracted little more than temporary interest, but are acknowledged by horticulturists to be rich in promise of possible amelioration. But this remark is true also of fruits of other regions, especially of fruits indigenous to the tropics, where improved methods of propagation and tillage have made slow progress.

Apart from the business side of fruit-growing already touched upon, the improvements made in the fruits themselves and in fruit culture during the last half of the nineteenth century have resulted mainly from the application of scientific discoveries in plant life. These discoveries and the improvements based upon them may be roughly divided into three general but closely related groups: Ecological (the influence of temperature, moisture, wind, air, drainage, soil); physiological (manuring, tilling, mulching, pollenizing, thinning, pruning, hybridizing, and selecting); parasitical and pathological (the control of animal and plant parasites, and of diseases due to organic disturbances). Concerning these, see MANURES AND MANURING; ECOLOGY; DISTRIBUTION OF PLANTS; TILLAGE; PLANT-BREEDING; PRUNING; MULCH; POLLINATION; CROSS-FERTILIZATION; FUNGI, ECONOMIC; FUNGICIDE; INSECTICIDE; HARVEST AND HARVESTING; IMPLEMENTS, AGRICULTURAL; WIND-BREAK; REFRIGERATION; and articles on the various fruits. Consult, also: Bailey, *Principles of Fruit-Growing* (New York, 1897); article "Pomology," in *Cyclopedia of American Horticulture* (New York, 1900).

FRUIT, FOSSIL. See CARPOLITH.

FRUIT-BAT. Any fruit-eating bat, especially of the Old World tropical family Pteropodidæ, called fox-bats, or flying foxes. These constitute a suborder, Megachiroptera, of the bats, based not only upon their large size, but upon distinctive structural features. The wings of fruit-bats have three, instead of one or two, joints in the second or index finger, which is generally provided with a claw, while the thumb alone of other bats possesses one. The ears are small, lack any inner tragus, and the conch forms a ring at its base; the tail, when present, is short, and beneath and free from the membrane between the hind legs. The teeth are unlike those of ordinary bats, particularly in the molars having

elongated flat crowns, adapted to crushing pulpy fruits, such as the fig and banana, which constitute nearly the entire diet of the group. These bats are regarded as a specialized offshoot from the ordinary type of insectivorous bats. Consult: Thomas, *Proceedings of the Zoölogical Society of London* (London, 1888). See FOX-BAT; HARPY BAT; TUBE-NOSE.

FRUIT-CROW. A name for several South American birds of the family Cotingidæ, and the genera *Gymnocephalus* and *Gymnodora*. They are closely related to the bell-birds and umbrella-birds (q.v.), are crow-like in appearance, and feed upon fruits to a great extent. They possess the baldness or tendency to wattles which characterizes the group, and one or more prominent species are known as 'baldheads.'

FRUIT-FLY. Any small fly of the family Trypetidæ. They are very numerous, and include many species which injure fruit and others that make galls. Most of them are minute, and all are marked with varied colors and spots. Prominent examples are *Trypeta pomonella*, whose larva, the apple-maggot, bores tunnels in apples. Another species, *Ceratitis capitata*, is highly injurious to peaches in the Old World, but is not met with in America. The Morelos orange-worm (see ORANGE-INSECTS) of Mexico is of this family, and others might be named. Consult: Loew, *Monographs of the Diptera of North America*, parts i. and iii. (Washington, 1862-73); Coquillett, "Descriptions of Trypetidæ," in *Journal of the New York Entomological Society* (New York, 1899). See GALL-INSECTS.

FRUIT-PIGEON. A pigeon of the family Treronidæ. They have the bill considerably depressed at the base, compressed and moderately arched at the tip, the membrane in which the nostrils are pierced little prominent or swollen, the forehead low, and the feathers advancing on the soft part of the bill, the wings moderately long, the feet, and particularly the hinder claw, large, and formed for grasping. During the breeding season a curious gristly knob grows on the base of the upper mandible of some of the species, and soon after disappears. They are birds of splendid plumage, natives of the forests of India, the Indian Archipelago, the warmer parts of Australia, the islands of the Pacific Ocean, and one species is found in Africa. There are about 80 species altogether, most of them contained in the genera *Carpophaga* and *Treron*. Their food consists of fruits, which are swallowed whole.

FRUMENTIUS, frōō-mēn'shī-us, SAINT. The apostle of the Abyssinians. About 316 he and his brother Edesius, both young boys, accompanied their uncle Meropius, a Greek philosopher of Tyre, on a trading voyage, or, according to others, a scientific expedition. Landing on the coast of Abyssinia, all were slain by the natives except the two boys, who became slaves in the service of the King. They won the confidence of their master, were raised to important positions, and ultimately were set free. After the death of the monarch, Frumentius became instructor to the young prince Aizanes, and obtained great influence in the administration of State affairs. He formed a church of native converts and Christian merchants who came to

the country. After the prince attained his majority, Edesius returned to Tyre, and became a presbyter. Frumentius went to Alexandria, and informed Athanasius, who had lately been nominated bishop, of the progress he had made in preparing the way for Christianity in Abyssinia, and was consecrated Bishop of Axum (328). After his return he baptized the King and made many converts. He is supposed to have translated the Bible into Ethiopian. Frumentius's day is celebrated by the Latins on October 27th, by the Greeks on November 30th, and by the Abyssinians on December 18th. See *ABYSSINIAN CHURCH*.

FRUNDSBERG, fröonts'bërk, or **FRONS-FEBG**, frôn'spërk, GEORG VON (1473-1528). A German soldier, called the "Father of the German *Landknechte*" (foot-soldiers or pikemen). He was born at the Castle of Mindelheim, Swabia, and received his military training in the wars of the House of Hapsburg against Switzerland, and in the Italian campaign between the League of Cambrai and Venice. In 1519 he was appointed commander-in-chief of all the infantry troops of the Swabian League. He also fought with distinction at the battle of Pavia (1525), and contributed greatly to the development of the famous German *Landknechte*, a military body which continued to take a prominent part in the European campaigns until the termination of the Thirty Years' War.

FRUSTUM. See *CONE*.

FRY, Sir EDWARD (1827-). An English jurist, born at Bristol, and educated at the college there and at University College, London. He was appointed judge of High Court, Chancery Division, in 1877, and was knighted in the same year. He was judge of the Court Appeal from 1883 to 1892, and in 1897 was president of the Royal Commission on the Irish Land Acts. In 1901 he became a member of the Permanent Court of Arbitration at The Hague. In his writings he displays considerable versatility: *Essays on the Accordance of Christianity with the Nature of Man* (1857); *A Treatise on the Specific Performance of Contracts* (3d ed. 1892); *British Mosses* (1892); *The Mycetozoa* (with Miss Agnes Fry, 1899); *Studies by the Way* (1900).

FRY, ELIZABETH (1780-1845). An English Quaker minister and prison reformer, born at Earlsam, Norfolk, daughter of John Gurney. As a child of fifteen, Elizabeth Fry became deeply interested in the house of correction at Norwich. In 1813 she first became practically engaged in prison reform, and turned her attention to the condition of women prisoners at Newgate. Under her leadership an association was formed in 1817 for the improvement of these unfortunates, and did much to better their condition materially and morally. Mrs. Fry also joined in the movement to induce the Government to make proper regulations for the voyage of convicts, at that time transported to New South Wales, and to make provision for their employment at the end of their voyage. She extended her activities throughout England, traveled from place to place, and founded prison associations. Her work attracted attention in other countries, also; and contributed materially to prison reform on the Continent. She wrote several works of minor importance. For the story of her life, consult the *Memoirs*, edited by her two daughters (2 vols., London,

1847); *Memoirs*, by Thomas Thompson (London, 1847); a *Life*, compiled from her journal by Susanna Corder (London, 1853); Timpson, *Memoirs of the Life of Mrs. Fry* (London, 1847).

FRY, JAMES BARNET (1827-94). An American soldier. He was born in Carrollton, Ill.; graduated at West Point in 1847, served for a time as assistant instructor of artillery there, was stationed successively in Oregon, Louisiana, and Texas, was instructor at West Point in 1853-54, and was adjutant of the Academy from 1854 to 1859. In March, 1861, he was appointed Assistant Adjutant-General, and later in the year acted as chief of staff to General McDowell. In 1862 he held a similar position under General Buell. He was then Provost-Marshal-General of the United States, with the staff rank of brigadier-general from March, 1863, until August, 1866, when this office was abolished. He subsequently served as Adjutant-General, with the regular rank of colonel, in the divisions of the Pacific, the Missouri, and the Atlantic, until 1881, when he retired. In July, 1866, he was brevetted major-general, and in June, 1868, brigadier-general. He published: *A Sketch of the Adjutant-General's Department, United States Army, from 1775 to 1875* (1875); *History and Legal Effects of Brevets in the Armies of Great Britain and the United States, from Their Origin in 1692 to the Present Time* (1877); *Army Sacrifices* (1879); *Operations of the Army Under Buell* (1884); *McDowell and Tyler in the Campaign of Bull Run* (1884); *New York and Conscript* (1885); *Military Miscellanies*, and *The Conkling and Blaine-Fry Controversy in 1866* (1893).

FRY, WILLIAM HENRY (1815-64). An American composer, journalist, and critic. He was born in Philadelphia, where his father, William Fry, was the proprietor of the *Philadelphia National Gazette*. He studied harmony under Meignen, and in 1835 the Philadelphia Philharmonic Society performed his first orchestral compositions, which consisted of four overtures. Ten years later he produced the opera *Leonora*, which was given in Philadelphia and New York; and in 1863 *Notre Dame de Paris*. He was the composer of several Church pieces, which have been much used. After six years in Paris as a newspaper correspondent, he returned to New York, and lectured upon the history and science of music. Besides his connection with his father's paper, he undertook the editorship of the *Philadelphia Ledger* in 1844. On his first return to New York, he joined the staff of the *Tribune* as musical editor, retaining the position up to his death, which occurred at Santa Cruz, W. I.

FRYE, WILLIAM PIERCE (1831-). An American legislator, born in Lewiston, Maine. He graduated at Bowdoin College in 1850, and after studying law in the office of William Pitt Fessenden, practiced his profession at Rockford and later at Lewiston. He was a member of the State Legislature in 1861-62, was a Presidential elector on the Lincoln ticket in 1864, and was again a member of the Legislature in 1866-67, serving at the same time as Mayor of Lewiston. In the fall of 1867 he was elected Attorney-General of the State, holding the office from 1867 to 1870. In 1871 he was elected to the National House of Representatives, and was reelected five

times, resigning his seat in 1881 to accept a seat in the United States Senate, to which he was promoted to fill the vacancy caused by the resignation of James G. Blaine to enter Garfield's Cabinet as Secretary of State. He was elected for the full term in 1883, and was reelected in 1889, 1895, and 1901. He was elected president *pro tempore* of the Senate in 1896, and has twice been called upon to act as the permanent presiding officer of that body—after the death of Vice-President Hobart, in 1899, and again after the elevation of Vice-President Roosevelt to the Presidency in 1901. In 1898, after the close of the Spanish War, Senator Frye was a member of the Peace Commission at Paris. He has had a great influence on national legislation, his services as chairman of the important Committee on Commerce, in which capacity he has framed the legislation and proposed legislation in regard to American shipping, being particularly notable.

FRYING. See COOKERY.

FRYKEN, frý'ken. A series of small lakes in the southern part of Sweden, north of Lake Wenern, and famed for beautiful scenery. They are arranged in three main groups, and are connected by narrow channels, the whole forming a river of irregular width.

FRYXELL, frýks'el, ANDERS (1795-1881). A Swedish historian. He was born at Edsleskog in Dalsland, and after studying at the University of Upsala became in 1819 instructor at the Djurgårdsskole in Stockholm, from which he went in 1822 to the Maria-Skole in the same city. From 1828 to 1836 he was rector of that institution. His interest lay chiefly in questions of public education. In 1835 he became pastor at Sunne, and in 1836 Bishop of Northern Wermland. From 1847 till his death, March 21, 1881, he devoted himself exclusively to historical research. His great work is the *Berättelser ur Svenska historien*, "Contributions to Swedish History" (46 vols., 1823-79), dealing with the history of his country till 1711. These narratives are marked not only by their patriotic sentiment, but by their fresh and natural conception, their richness of biographic detail, and their naïve and vivacious style. They possess, too, the faults of their kind, and have been criticised for their diffuseness and lack of critical insight. The *Berättelser* have nevertheless become a national classic. His *Characteristics of the Period from 1592 to 1600 in Sweden* (1831) received the grand prize of the Swedish Academy. Between 1845 and 1850 he published *Om aristokrat-fördömandet i Svenska historien*, "The Role of the Aristocracy in Swedish History." This was in the nature of a defense of the Swedish nobility, and brought upon him the hatred of the Liberal element in Sweden. Fryxell's minor works include: *Handlingar rörande Sveriges historia*, "Studies in Swedish History" (1836-43); and *Bidrag till Sveriges litteratur-historia*, "Contributions to the History of Swedish Literature" (1860-62). His autobiography, *Min historias historia*, appeared at Stockholm in 1884.

F'S AUNT, MR. A character in Dickens's *Little Dorrit*. She was left to Mrs. F. by her husband as a not very acceptable legacy.

FUAD PASHA, fú'ád pá-shá' (1814-69). A Turkish statesman and scholar, born in Constantinople.

He was the son of the poet Izzet Mollah, and nephew of Leila Khatun, one of the very few Turkish poetesses. He studied medicine at Galata-Serai from 1828 to 1832. In 1834 he was appointed Admiralty physician, and accompanied the Grand Admiral in his expedition against Tripoli. On his return to Constantinople he forsook medicine and entered the Bureau of Interpreters for the Porte. In 1840 he became First Secretary to the Turkish Embassy at London, and served in various diplomatic positions until in 1848 he was appointed Grand Interpreter to the Porte. In 1850 he went on a mission to Saint Petersburg, and in 1853 on another to Egypt. On his return from the first of these he became Minister of Foreign Affairs under the Grand Viziership of Aali Pasha. In 1854 Fuad went to Epirus along with Omer Pasha, where he suppressed the insurrection with great energy. In the following year he received the title of pasha, and was again appointed Minister of Foreign Affairs, and represented Turkey at Paris in the regulation of the affairs of the Danubian Principalities. In 1860 he was sent to Damascus in consequence of the disorders in the Lebanon. (See DRUSES.) In 1861 he held the office of Grand Vizier. In 1862 he became Minister of Finance, and in 1867 again Minister of Foreign Affairs. He died in 1869. When the Turkish Academy of Science and Belles-Lettres was established, in 1851, Fuad became one of the first members, and in the following year he published a Turkish grammar, which is highly esteemed by native scholars. He also wrote a poem on the Alhambra. He received many honors and decorations from European sovereigns.

FUCA, fú'ká, JUAN DE (?-1602). A Greek navigator, whose real name was Apostolos Valerianos. He was born in Cephalonia, and is celebrated as the discoverer of the straits named after him, and separating the island of Vancouver from Washington and connecting the Pacific with the Gulf of Georgia. Little is known of his career, except that he served for more than thirty-five years in the East Indies as a pilot in the Spanish Navy, and that in 1506 he applied for admission to the English service. In his report he claims to have discovered a strait uniting the Pacific with the Atlantic.

FUCA, JUAN DE, STRAIT OF. A passage separating the State of Washington, in the United States, from Vancouver Island. It connects the Pacific Ocean with the Strait of Georgia on the north and Puget Sound on the south, having its outer, or western, entrance in latitude 48° 30' N. and longitude 124° 40' W. (Map: Washington, A 1). It is important as the water route from Vancouver and the Puget Sound cities to the Pacific Ocean. It is about 100 miles long from east to west, and about 15 miles wide in the western part; but expands to double that width in the eastern section. It contains several islands in its eastern part, one of which (San Juan) became the subject of a dispute between Great Britain and the United States, the question being whether it was to be regarded as an appendage of Washington Territory or of British Columbia. The question was submitted in 1872 to the Emperor of Germany as arbiter, and he decided that the line of boundary should be run through the Strait of Haro, west of San Juan, thus awarding that island to the United States.

FU-CHAU, fū'chou'. See **FU-CHOW**.

FU-CHOW, or **FOO-CHOW** (Chin., Happy Region). A walled city of China, capital of the Province of Fu-kien, and one of the five ports opened to foreign residence and trade by the treaty negotiated by the British at Nanking in 1842. The name is also sometimes spelled Fuh-chow, Fuh-chau, Foo-choo, and Fu-chou, and sometimes has appended to it the syllable fu, or foo, meaning 'department' or 'departmental city.' In the local dialect it is pronounced Hok-chiu.

Fu-chow is well situated in a beautiful and fertile plain, 34 miles from the mouth of the river Min, and about two miles back from the north bank of the northern branch of the river, opposite the long, narrow island called Nan-t'ai. Its walls, which have a circuit of about 6½ miles, and are pierced with seven massive gates, surmounted with lofty towers, inclose three finely wooded hills—'Black Rock Hill,' in the southwest angle; the 'Hill of the Nine Genii,' in the southeast; and 'Screen Hill,' in the northeast. The eastern part of the inclosure is known as the Tatar town, a garrison having been established here by the conquering Manchus in the seventeenth century. The principal street of the city runs from north to south, and is continued through the south gate by a long causeway to and through the city's most populous and most important suburb on the river bank. From this point a celebrated stone bridge—the 'Bridge of Ten Thousand Ages'—leads across the river to a densely peopled little island, Tong-chiu ('Middle Island'), and from this island another stone bridge 300 feet in length completes the line of communication with the foreign settlement on the island of Nan-t'ai. The Bridge of Ten Thousand Ages is said to have been built over eight centuries ago. It is 1350 feet long, about 14 feet in width, and is formed of a granite causeway laid upon thick stone slabs 45 feet long, which rest on about 40 immense stone piers. Strong stone parapets mortised into large stone pillars protect pedestrians. This is the limit of navigation for sea-going junks; but barges and smaller craft with movable masts may pass under the bridge. Foreign vessels, except those of very light draught, anchor ten miles lower down, off a small island with a pagoda on it, which lies off the lower end of Nan-t'ai Island.

Near here, on the left bank of the river, are the arsenal and navy-yard, established in 1867, and managed by Frenchmen. Many war vessels have been launched here, and most of the naval officers of China were trained in the school of navigation attached to the arsenal. In 1884, during hostilities with France, the arsenal and the fortifications in the neighborhood suffered greatly from a brief bombardment by the French. There is also a dry-dock, 300 feet long, with powerful pumps and steel caissons.

Cotton-mills, with special concessions from the Government, have been established here, and more recently a match-factory. The mint is now issuing one-cent, ten-cent, and twenty-cent pieces, which are gradually finding their way over the country. Among the other articles produced are 'soapstone' or steatite figures, vases, and other ornamental objects, artificial flowers, and figures of birds carved in charcoal and colored to represent the living originals. Fu-chow lacquer is also well known.

Fu-chow was opened to foreign commerce in 1842, but it was not until 1853 that the tea trade of the port began to assume any importance. Since 1880 it has dwindled greatly. In 1900 the net value of the trade of the port was \$11,045,800, of which \$3,889,490 represented native produce of local origin sent to foreign countries; \$1,166,030 native produce of local origin sent to Chinese ports; and \$1,926,835 native produce imported chiefly from Shanghai. In the same year the gross value of foreign imports—that is, including reexports—was \$4,088,560, of which goods to the value of \$3,476,560 came from foreign countries or through Hong Kong, and the rest from Chinese ports. The chief articles imported from foreign countries were opium, cotton goods, lead, tin, tinplate, steel, kerosene oil, machinery, flour, and sugar, and the chief exports were timber, wood for kerosene-oil cases, tea, canes, matches, and various kinds of fruit.

The shipping returns show that 291 steamers, with a tonnage of 351,661 tons, entered inward, the different nationalities being represented as follows:

	Steamers	Tons
British	174	249,908
United States.....	3	2,386
German.....	15	38,660
Dutch.....	1	1,968
Swedish and Norwegian.....	5	8,027
Russian.....	1	542
Japanese.....	50	15,537
Chinese.....	42	34,643

The port is now connected by telegraph with the principal cities of China, and by cable with Formosa, Hong Kong, and Europe.

Fu-chow is the residence of the Governor of Fu-kien Province, and of the Viceroy, or Governor-General, of the united provinces of Che-kiang and Fu-kien, officially known as Che-Min, Min being the ancient name of this region.

The population of the city, including its seven suburbs, has been estimated at 636,000.

BIBLIOGRAPHY. For a good description of the city, see Doolittle, *Social Life of the Chinese* (New York, 1867), and Mayer and others, *The Treaty Ports of China and Japan* (London, 1867). For statistics, consult: The annual reports of the Imperial Maritime Customs of China, and *Commercial China in 1899*, issued by the United States Treasury Department Bureau of Statistics (Washington, D. C.). For the language, consult: Maclay, *Manual of the Foo-chow Dialect*, and Maclay and Baldwin, *Chinese-English Dictionary* (1871).

FUCHS, fooks, ERNST (1851—). A German ophthalmologist. He was born and educated at Vienna, and after holding a professorship at the University of Liège (1881-86) was appointed to the chair of ophthalmology at the University of Vienna. His principal publications, most of which are translated into German and French, include: *Das Sarcom des Uvealtractus* (1882); *Die Ursachen und die Verhütung der Blindheit* (1885); *Lehrbuch der Augenheilkunde* (1889).

FUCHS, IMMANUEL LAZARUS, also called LUDWIG (1833-1902). A German mathematician, born at Moschin, in Posen. After teaching mathematics in several institutions, he became professor extraordinary at Berlin in 1866, and full professor of mathematics at Greifswald in 1869,

at Göttingen in 1874, at Heidelberg in 1875, and at Berlin in 1884. His principal contributions bear upon the theory of functions and the theory of linear differential equations. After Kronecker's death, in 1891, he became editor of the *Journal für die reine und angewandte Mathematik*. His name has been connected by Poincaré with a discontinuous group ('Fuchsians') which is very important in the general theory of functions, and is frequently discussed by Poincaré in the volumes of *Acta Mathematica* (Stockholm).

FUCHS, JOHANN NEPOMUK VON (1774-1856). A German chemist and mineralogist. He was born at Mattenzell, studied at Freiberg, Berlin, and Paris, was professor at Landshut and Munich, and was curator of the mineralogical collection and a member of the Academy at Munich. He published a number of interesting papers on chemistry, mineralogy, and crystallography, and his *Gesammelte Schriften* were published at Munich in 1856. He is known for his process of making a soluble glass used in fixing fresco colors.

FUCHS, KONRAD HEINRICH (1803-55). A German physician, born at Bamberg, and educated at Würzburg. He was professor of pathology and therapy at Göttingen from 1838 until his death, and wrote the important work entitled *Lehrbuch der speziellen Nosologie und Therapie* (1844-48). He also published an edition of the earliest writers on syphilis in Germany, *Die ältesten Schriftsteller über die Lustseuche in Deutschland* (1843). The pathologico-anatomical collection at the University of Göttingen was founded by him.

FUCHS, or **FUCHSIUS**, fook'sé-foos, LEONHARD (1501-66). A celebrated German botanist. He was born at Wemdingen, in Bavaria, studied at Ingolstadt, under Reuchlin, and in 1535 became professor of medicine at Tübingen. He published a number of excellent works on botany, the most important of which is his beautifully illustrated *De Historia Stirpium Commentarii Insignes* (1545). This is one of the books with which the modern science of botany began to exist. The fanciful speculations of the Middle Ages were abandoned, and men began to study the facts and phenomena of real nature. Fuchs described with great clearness a large number of plants, and even endeavored to establish a rational system of nomenclature. He is justly known as one of the fathers of scientific botany.

FUCHSIA (Neo-Lat., named in honor of Leonhard Fuchs). A genus of plants of the natural order Onagraceæ, which contains about 70 species, mostly natives of tropical America. Some are climbers, some small trees, but the majority are shrubs or half-shrubby herbs. The leaves are opposite. The flowers, which are solitary and axillary, or sometimes arranged in terminal racemes, are generally pendulous, have a funnel-shaped, four-cleft, finely colored calyx, a four-petaled, usually red, corolla, and a four-celled berry, which in some species is edible. Several species are largely employed as greenhouse plants, and in climates not too rigorous they are grown out of doors with slight protection during the cold season. They are deservedly popular, because they yield a satisfactory display of bloom with less care in propagation and management than almost any other house plant, and

in consequence of their beauty and gracefulness, they have developed a great number of varieties, not only of the colors and forms they possess in nature, but others, such as white and double, which are not peculiar to the species from which they originate. *Fuchsia macrostemma*, a very variable Chilean species, first attracted European attention about 1790, and for about seventy-five years usurped both name and fame of *Fuchsia coccinea*, which is considered a more attractive and free-blooming species. It has been largely employed, either singly or in crossing with *Fuchsia fulgens*, in the production of cultivated forms. See Bailey, *Cyclopedia of American Horticulture* (New York, 1900).

FUCINO, fōo-ché'nō, LAKE. A former lake in Italy, the ancient Lacus Fucinus, now a vast fertile farm (Map: Italy, H 6). For history of its drainage, see AVEZZANO.

FUDGE FAMILY IN PARIS, THE. A skit by Thomas Moore (1818), satirizing the underbred English in foreign countries. The satire was followed by a sequel, *The Fudge Family in England*.

FUEGIAN, fū-é'ji-an. See TIERRA DEL FUEGO; ONA; YAHGAN.

FUEL (OF. *fouailles*, from ML. *focale*, fuel, from Lat. *focus*, hearth). Any material that is capable of being utilized for the heat it produces upon union with oxygen. (See COMBUSTION.) The fuel of greatest economical importance is coal. Many other substances are, however, rated very high commercially and industrially as fuels. Some of these substances, such as wood, peat, and crude petroleum, are of natural origin; others, such as coke, charcoal, and coal-gas, are formed artificially. A useful classification of fuels is that which divides them according to their state of aggregation, and this classification will be followed in the present article. To enumerate: The principal solid fuels are coal, peat, coke, charcoal, and wood; the liquid fuels include petroleum, shale oils, and vegetable and animal oils; the gaseous fuels include coal-gas, producer gas, water-gas, mixed gas, and natural gas. The heat of combustion—i.e. the heat generated by the combustion of a certain quantity in oxygen—measures the 'calorific power' or 'heat value' of a fuel. However, the terms calorific power and heat value have, in common usage, a slightly wider significance than the term 'heat of combustion.' The latter term is applied only to the quantity of heat generated by the substance when completely burned—that is, when the carbon and hydrogen are completely changed to carbonic acid and water. The terms 'calorific power' and 'heating value,' on the contrary, apply to the measure of an industrial yield as well as to the heat given off by the fuel during its complete combustion. Scientifically, the term 'heat of combustion' is the most nearly correct. The units of measure of the quantity of the heat of combustion are the *calorie* and the *British thermal unit*. The calorie is the quantity of heat required to raise the temperature of one kilogram of water one degree centigrade. The British thermal unit (usually abbreviated, B. T. U.) is the quantity of heat required to raise the temperature of one pound of pure water one degree Fahrenheit.

There are two methods for finding the heat of

combustion of substances: (1) Calculation based on chemical composition, and (2) experimental determination by means of a calorimeter. By the first method the units may be calculated directly from the composition of the substance, or calculation of the heat of combustion from the composition of the substance, or indirectly from the quantity of oxygen consumed during combustion in a crucible. The direct calculation of the heat of combustion from the chemical composition of the fuel is usually performed by means of Dulong's formula. Other general formulas are in use, but they all resemble Dulong's, and are usually only modifications of his. Dulong's formula, with recent average figures for the constants, as given by Mr. William Kent, for coal, is: Heating value per pound in

$$\text{B. T. U. equals } \frac{1}{100} [14,850 C + 62,000 \left(H - \frac{O}{8} \right)$$

+ 4000 S], in which C, H, O, and S are respectively the percentages of carbon, hydrogen, oxygen, and sulphur in the coal. Mr. Kent points out, as the result of a comparison of numerous data, that the relation of the heat of combustion of coal to its ultimate analysis is expressed by Dulong's formula with remarkable accuracy—that is, within a limit of error of usually less than 2 per cent. The method of calculating the heat of combustion indirectly, from the quantity of oxygen consumed, is also expressed by a gen-

the apparatus complete with its accessories, and Fig. 2 shows the combustion-chamber, or bomb, separated from the other apparatus. The combustion-chamber (Fig. 2) consists first of a steel shell, P, and a stopper or cover, E. The shell has a capacity of 40 cubic inches, is nickered on the outside, and has a coating of enamel on the inside. The stopper E screws down tightly into the shell, and is made of iron. It carries a stop-cock, R, of fine nickel, and through its top passes an insulated electrode, D, reaching the interior by a platinum wire. Another platinum wire, suspended from the cover, carries a disk, F, on which the fuel is placed. The bomb is supported inside a cylindrical vessel so as to be surrounded by water, as shown by Fig. 1. In this illustration, L is a pump-like mechanism for agitating the water surrounding the bomb; O is a cylinder containing oxygen under pressure; M is a pressure-gauge; and B is an electric battery. The manipulation of the apparatus and the fuel in making a test is substantially as follows: Weigh one grain of the fuel to be tested and place it on the disk F; then make connection between the electrode D and the disk F; screw down the cover E; put the stop-cock R in connection with the oxygen cylinder O, and open it carefully, so as to allow sufficient oxygen to pass into the bomb for the required pressure; close the cock of the oxygen-chamber, then the

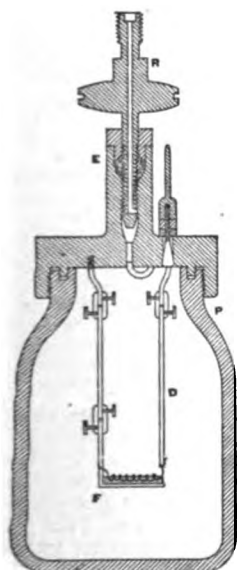


FIG. 2. SECTION OF COMBUSTION CHAMBER OF MAHLER CALORIMETER.

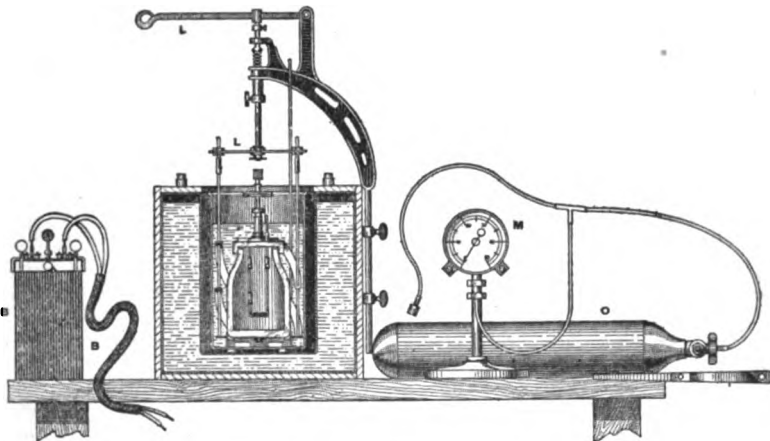


FIG. 1. MAHLER CALORIMETER FOR MEASURING THE HEATING VALUE OF FUEL.

eral formula; but this formula has been shown to be of very questionable value, and is now used only where no other methods of determination are possible.

It is generally conceded that the ultimate test of the heat of combustion of a fuel is its determination by actual combustion in a calorimeter. Calorimeters are made in various forms, but they all consist of a combustion-chamber in which the sample of fuel is burned, surrounded by a chamber containing a known quantity of water, whose rise of temperature is shown by a thermometer. The Mahler calorimeter (one of the most perfect of such devices) is shown in the accompanying engravings, of which Fig. 1 shows

cock R, and then disconnect the oxygen-chamber; place the bomb in the water-chamber, and adjust the agitator L and the thermometer; pour in the previously weighed water, and operate the agitator a few minutes to restore equilibrium of temperature; note the thermometer; connect the electrode with the battery, and thus kindle the fuel; read the thermometer one-half minute after kindling, then at minute intervals until the readings begin to decrease regularly; next open the cock R, and afterwards the bomb, which should be washed inside with distilled water to collect the acids formed, and determine the acids volumetrically. The mode of procedure described furnishes all the data to be obtained by the test proper; the observer then proceeds to calculate the heat of combustion from these data. This calculation is a rather formidable one, and the

interested reader should consult special treatises on calorimetry for its explanation. The result obtained is the heat of combustion expressed in terms of calories or of British thermal units. (See HEAT; THERMO-CHEMISTRY.) When coal is the fuel tested, it is reduced to moderately coarse powder before being placed on the disk. Heavy oils, tars, etc., are weighed directly onto the disk. Volatile oils are inclosed in pointed glass bulbs, which are placed on the disk, and the ends of which are broken off just before closing the bomb. Gases are simply pumped into the bomb. A calorimetric test, in order to give reliable results, requires expert manipulation and extreme care.

SOLID FUELS. Of the solid fuels used at present, coal is by all odds the most important. Coal is a very varied product, and its value as a fuel is correspondingly variable. According to geologists, a bed of coal was many ages ago a mass of damp vegetable fibre, a portion of a peat-bog. Through successive geologic ages the peat-bog was submerged and overlaid with mud and glacial drift, tilted and compressed by upheavals of the earth's crust, and subjected to intense heat. During these processes it underwent a more or less complete destructive distillation. The conditions under which this distillation took place were not uniform; the variable factors were time, depth, and porosity of the overlying strata, pressure and temperature, disturbance of the beds, and the intrusion into them of mineral substances, such as clay, sand, iron, and sulphur. As a consequence, the product of the distillation—namely, coal—varies all the way from the original peat, through brown coal or lignite, bituminous, semi-bituminous, semi-anthracite, and anthracite, to graphitic coal. Graphitic coal has nearly all the volatile

lies in the fact that they determine the relative heating value of the different coals for fuel. An illustration will explain this truth. Coal is composed of four different substances, which may be separated by proximate analysis—namely, fixed carbon, volatile hydrocarbon, ash, and water. When coal is burned the moisture is first driven off at a temperature of 250° to 300° F.; then the volatile matter is driven off at a red heat; then the carbon is burned out of the remaining coke at a white heat, until nothing is left but ash. The fixed carbon has a constant heating value of about 14,600 B. T. U. per pound. The heat value of the volatile hydrocarbon depends on its composition, and that depends chiefly upon the district in which the coal is mined. It may be as high as 21,000 B. T. U. per pound in the best bituminous coals containing very little oxygen, or as low as 10,000 B. T. U. per pound in some of the poorest bituminous coals having a high percentage of oxygen. The ash has no heating value, and the water has in effect less than none, for its evaporation and the superheating of the steam made from it to the temperature of the chimney gases absorb some of the heat generated by the combustion of the fixed carbon and the volatile matter. The heating value per pound varies in different districts, and bears a relation to the percentage of volatile matter. It is the highest in the semi-bituminous coals, being nearly constant at 15,750 B. T. U. per pound; it is between 14,500 and 15,000 B. T. U. in anthracite, and ranges from 15,000 B. T. U. down to 13,000 B. T. U. or less in the bituminous coals, decreasing usually as we go westward, and as the volatile matter contains an increasing percentage of oxygen, as shown by Table II. Tables I. and II. refer only to American coals, and they will be

TABLE I.—CLASSIFICATIONS OF COALS ACCORDING TO THE RELATIVE PERCENTAGE OF CARBON AND VOLATILE MATTER

KINDS OF COAL	Per cent. fixed carbon	Per cent. volatile matter	Heating value B. T. U. per lb.	Relative combustible value
Anthracite.....	97 to 92½	3 to 7½	14,600 to 14,800	93
Semi-anthracite.....	92½ " 87½	7½ " 12½	14,700 " 15,000	94
Semi-bituminous.....	87½ " 75	12½ " 25	15,500 " 16,000	100
Bituminous, Eastern.....	75½ " 60	25 " 40	14,800 " 15,200	95
" Western.....	65 " 50	35 " 50	13,500 " 14,800	90
Lignite.....	under 50	over 50	11,000 " 13,500	77

hydrocarbon gases and oxygen driven off from it, leaving practically only fixed carbon and ash, the carbon being in a form so hard to burn that the coal is not used as a commercial fuel. Lignite is at the extreme opposite end of the scale of coals, it being only one remove from the original peat—that is, the proportion of fixed carbon is small, and the proportion of volatile matter large. Between these two extremes come the other classes of coal. To summarize, we thus have different varieties of coal, due to differences in the extent to which the volatile gases have been driven off from the original peat or other woody coal-forming substance. There are also differences in quality in each variety, due to varying percentages of ash and water. The ash or earthy matter in coal ranges from 2 to over 30 per cent.; the water ranges from less than 1 per cent. in the anthracites up to 14 per cent. or more in some of the bituminous coals, and to 25 per cent. or more in some of the lignites. The importance of stating the preceding circumstances

understood clearly if studied in connection with the preceding discussion, with the exception possibly of the last column of Table II. This column has been inserted to show the relative theoretical value of the different coals for evaporating water from 212° F. to steam at 212° F. The following general figures of the heating value of foreign coals give a basis for a rough comparison between American and foreign products:

COUNTRY	Heating value in B. T. U.
Chile.....	11,758 to 14,954
France.....	15,080 " 16,560
Great Britain.....	14,000 " 15,965
Austria-Hungary.....	12,213 " 15,131
Germany.....	11,045 " 15,847
Spain.....	9,556 " 14,113
Russia.....	8,748 " 15,065
New Zealand.....	9,846 " 15,364

These values are the maximum and minimum in each case from a large number of tests. The purposes for which different kinds of coal are

TABLE II.—SHOWING PROXIMATE ANALYSES AND HEATING VALUE OF AMERICAN COALS

	Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Heating value per lb. coal, heat units	Volatile matter per cent. of combustible	Heating value per lb. combustible, heat units	Theoretical evaporation lbs. water from and at 212° per lb. combustible
ANTHRACITE									
Northern coal field.....	3.42	4.38	83.27	8.20	.73	13,160	5.00	14,900	15.42
East Middle coal field.....	3.71	3.08	86.40	6.22	.58	13,420	3.44	14,900	15.42
West Middle coal field.....	3.16	3.72	81.59	10.65	.50	12,840	4.36	14,900	15.42
Southern coal field.....	3.09	4.28	83.81	8.18	.64	13,220	4.85	14,900	15.42
SEMI-ANTHRACITE									
Loyalsock field.....	1.30	8.10	83.34	6.23	1.63	13,920	8.86	15,500	16.05
Bernice basin.....	.65	9.40	83.69	5.34	.91	13,700	10.98	15,500	16.05
SEMI-BITUMINOUS									
Broad Top, Pa.....	.79	15.61	77.30	5.40	.90	14,820	17.60	15,800	16.36
Clearfield County, Pa.....	.76	22.52	71.82	3.99	.91	14,950	24.60	15,700	16.25
Cambria County, Pa.....	.94	19.20	71.12	7.04	1.70	14,450	22.71	15,700	16.25
Somerset County, Pa.....	1.58	16.42	71.51	8.62	1.87	14,200	20.37	15,800	16.36
Cumberland, Md.....	1.09	17.30	73.12	7.75	.74	14,400	19.79	15,800	16.36
Pocahontas, Va.....	1.00	21.00	74.39	3.03	.58	15,070	22.50	15,700	16.25
New River, W. Va.....	.85	17.88	77.64	3.36	.27	15,220	18.95	15,800	16.36
BITUMINOUS									
Connellsville, Pa.....	1.26	30.12	59.61	8.23	.78	14,050	34.03	15,300	15.84
Youghiogheny, Pa.....	1.03	36.50	59.05	2.61	.81	14,450	38.73	15,000	15.53
Pittsburg, Pa.....	1.37	35.90	52.21	8.02	1.80	13,410	41.61	14,800	15.32
Jefferson County, Pa.....	1.21	32.53	60.99	4.27	1.00	14,370	35.47	15,200	15.74
Middle Kittanning seam, Pa.....	1.81	35.33	53.70	7.18	1.98	13,200	40.27	14,500	15.01
Upper Freeport seam, Pa. and Ohio.....	1.93	35.90	50.19	9.10	2.89	13,170	43.59	14,800	15.32
Thacker, W. Va.....	1.38	35.04	56.03	6.27	1.28	14,040	39.33	15,200	15.74
Jackson County, Ohio.....	3.83	32.07	57.60	6.50	.....	13,090	35.76	14,600	15.11
Brier Hill, Ohio.....	4.80	34.60	56.30	4.30	.....	13,010	38.20	14,300	14.80
Hocking Valley, Ohio.....	6.59	34.97	48.85	8.00	1.59	12,130	42.81	14,200	14.70
Vanderpool, Ky.....	4.00	34.10	54.60	7.30	.....	12,770	38.50	14,400	14.91
Muhlenberg County, Ky.....	4.33	33.65	55.50	4.95	1.57	13,060	38.86	14,400(?)	14.91
Scott County, Tenn.....	1.26	35.76	53.14	8.02	1.80	13,700	34.17	15,100(?)	15.63
Jefferson County, Ala.....	1.55	34.44	59.77	2.62	1.42	13,770	37.63	14,400(?)	14.91
Big Muddy, Ill.....	7.50	30.70	53.80	8.00	.....	12,420	36.30	14,700	15.22
Mount Olive, Ill.....	11.00	35.65	37.10	13.00	.....	10,490	47.00	13,800	14.29
Streator, Ill.....	12.00	33.30	40.70	14.00	.....	10,580	45.00	14,300	14.80
Missouri.....	6.44	37.57	47.94	8.05	.....	12,230	43.94	14,300(?)	14.80
LIGNITES AND LIGNITIC COALS									
Iowa.....	8.45	37.09	35.60	18.86	.....	8,720	51.03	12,000(?)	12.42
Wyoming.....	8.19	38.72	41.83	11.26	.....	10,390	48.07	12,900(?)	13.35
Utah.....	9.29	41.97	44.37	3.20	1.18	11,030	48.60	12,600(?)	13.04
Oregon Lignite.....	15.25	42.98	33.32	7.11	1.66	8,540	54.95	11,000(?)	11.39

used do not admit of any very definite classification. The coal used in any particular country or locality is determined nearly always by questions of availability and cost. In America the use of anthracite coal is nearly universal for domestic purposes in the East, and it is also used for industrial purposes in many Eastern cities where public sentiment demands the use of a smokeless fuel. The great industrial fuel, however, is coal of the semi-anthracite and bituminous classes, and the coal used in any particular locality is usually the coal which is most available and the cheapest.

The solid fuels other than coal are coke, charcoal, coal briquettes, coal-dust, peat, wood, sawdust, tanbark, straw, and bagasse. *Coke* is the solid material left after evaporating the volatile ingredients of coal, either by means of partial combustion in furnaces called coke-ovens, or by distillation in the retorts of gas-works. It is considerably used as a domestic fuel, and somewhat used for steam-making where some special condition prevails, such as the necessity for a smokeless fuel. For general steam-making, however, its cost and the difficulty of its combustion in ordinary furnaces place coke rather low in the list of fuels available to the steam-user. For metallurgical processes, an important example of which is iron-smelting, coke is almost an invaluable fuel. Coke is composed mostly of fixed carbon and ash, the percentage of volatile matter

being seldom over two per cent., and often less than one per cent., of the total. Its heating value ranges generally between 14,400 and 14,600 B. T. U. See *Coke*.

Charcoal is the carbonaceous residue of wood which has been subjected to a process of smothered combustion. Its principal use as a fuel is in smelting certain kinds of iron. A small amount is used for domestic heating and cooking, and for heating purposes in certain trades and arts. Pure charcoal is nearly pure carbon, but commercial charcoal contains considerable volatile matter which is a decided advantage to it as a fuel. In fact, it has been shown that half-burned charcoal is superior as a fuel to that more completely burned. The heat value of ordinary commercial charcoal is between 7000 and 7200 calories.

Briquettes, or patent fuel as they are sometimes called, are composed of coal or coke dust mixed with a binder of pitch, tar, or other substance, and pressed or molded into blocks, bricks, ovoids, or other forms. Briquettes are not made to any extent in the United States, but in Great Britain and Continental Europe their manufacture constitutes an important industry. They are used like coal for steam-making, and industrial and domestic purposes generally.

Coal-dust, as the name implies, is coal ground to a fine dust or powder. Theoretically coal-dust should be a most excellent fuel, but it has the

practical objection of requiring a rather costly apparatus for grinding the coal and feeding it to the furnace, and of requiring great care in its combustion. The manner in which coal-dust is burned is to inject it into the furnace through nozzles or burners by means of air-pressure. The furnace used differs from the ordinary coal-burning furnace in being closed and without grates; both the fuel and the air for its combustion enter the furnace through the nozzle or burner. Powdered coal was used as a fuel in England as early as 1873, but without much success, and the same lack of success has distinguished most of the subsequent attempts to employ it in steam-making. Quite recently, however, coal-dust has been used in firing cement-kilns of the rotary type with so much success that it is now the standard fuel for the rotary kiln process of cement manufacture. The heat of combustion of coal-dust is of course the same as that of the coal from which it is ground; its economy as a fuel comes from the fact that in the finely powdered state of dust the coal burns rapidly and thoroughly without the waste of unburned particles and the formation of clinker; that the combustion is smokeless; and that the cost of firing, furnace repairs, and handling of waste is reduced.

Peat is the agglomeration of partly decomposed vegetable matter obtained from peat-bogs, cut into blocks, and dried to serve as a fuel. Its composition varies but little from that of wood, the composition of Irish peat, for example, being carbon 59 per cent., hydrogen 6 per cent., oxygen 30 per cent., nitrogen 1 per cent., and ash 4 per cent. Air-dried peat contains from 10 to 25 per cent. of water. The heat of combustion of peat is lower than that of brown coal or lignite; for dry Irish peat it is about 10,250 B. T. U., and for moist Irish peat it is about 7390 B. T. U. Generally speaking, a pound of peat will evaporate about five pounds of water from and at 212° F. Peat does not rank as a commercial fuel in the United States; but in Ireland, and some of the western countries of Continental Europe, it is so extensively used that the peat industry is one of importance.

Wood is perhaps the most widely known and used of all fuels. Wood when newly felled contains from 30 to 50 per cent. of water, which after from eight to twelve months' drying in air is reduced to from 20 to 25 per cent. When used as a fuel wood should be as dry as possible, as otherwise some of the heat generated by its combustion is wasted in vaporizing the contained moisture. The following table shows the composition and heating value of the more common woods:

KIND	Carbon	Hydrogen	Oxygen	Nitrogen	Ash	B. T. U.
Ash.....	49.18	6.27	43.91	0.07	0.57	8,480
Beech.....	49.06	6.11	44.17	0.09	0.57	8,591
Birch.....	48.88	6.06	44.67	0.10	0.29	8,586
Elm.....	48.89	6.20	44.25	0.06	0.50	8,510
Fir.....	50.36	5.92	43.39	0.06	0.28	9,063
Oak.....	50.16	6.02	43.36	0.09	0.37	8,316
Pine.....	50.31	6.20	43.08	0.04	0.37	9,153

It will be noted that the coniferous woods have the higher heating values, due to the contained hydrocarbons in the form of pitch and turpentine. Pine knot containing much pitch has given as high as 10,863 B. T. U. by test. Wood was formerly much used for steam-raising, and is now

used for this purpose in newly settled countries and where coal cannot be obtained cheaply. The countries using wood for making steam are, however, growing fewer each year, owing to the discovery of new coal deposits, and the development of transportation systems by which coal can be cheaply imported. Evaporative tests made by Brix in Europe gave the following results in pounds of water evaporated per pound of fuel: Pine, 5.5 pounds; elm, 4.6 pounds; birch, 4.5 pounds; oak, 4.56 pounds; ash, 4.63 pounds; and beech, 4.47 pounds.

Sawdust is often used as a fuel in steam saw-mills. The conditions necessary for burning sawdust are that plenty of room be given it in the furnace, and sufficient air supplied on the surface of the mass. It is sometimes burned by blowing it into the furnace by air pressure, much as coal-dust is burned. The heating power of dry sawdust is naturally the same per pound as that of the wood from which it is derived. Generally speaking, sawdust cannot be profitably burned except in furnaces especially designed for its combustion, and where it costs nothing. Sawdust briquettes have been made and utilized as fuel, but only to a very limited extent. *Tanbark* or more correctly the residue of tanbark which has been used in the process of tanning, is sometimes used as a fuel where it can be had at slight cost. The heating value of perfectly dry tan containing 15 per cent. of ash is 6100 B. T. U., according to Peclet. The same authority states that tan in the ordinary state of dryness, containing 30 per cent. of water, has a heating value of only 4284 B. T. U. The weight of water evaporated from and at 212° F. by one pound of tan, equivalent to these heating powers, is, for perfectly dry tan, 5.146 pounds, and for tan with 30 per cent. moisture, 3.84 pounds. *Straw*, like sawdust and tanbark, is used as fuel under special conditions. Experiments have shown dry winter-wheat straw to have a heating value of 6290 B. T. U., and the same straw with 10 per cent. water a value of 5448 B. T. U. *Bagasse* is the refuse of sugarcane after the juice has been extracted. It is much used as a fuel under the boilers of sugar-mills. Its heating value is from 2000 to 3000 B. T. U., depending upon the quality.

LIQUID FUELS. The only liquid fuels of practical importance are the mineral oils. Animal and vegetable oils may be used for fuel, but, on account of their cost and the demand for them for other uses, they are not used in the arts for heating except on very exceptional occasions. A consideration of liquid fuels is, therefore, confined entirely to a consideration of mineral oil, petroleum and its distillates and residues. Crude

petroleum is a hydrocarbon often containing a small percentage of sulphur and oxygen as impurities. It may be broken up by distillation into gasoline, benzine, kerosenes, and other less familiar distillates and residuum of various qualities, any one of which makes a very good fuel un-

der certain conditions. *Gasoline* and its associated distillates are too valuable for other purposes ever to be used as fuel. *Benzine* will also have a restricted use as fuel owing to the difficulty, danger, and expense of transporting it, and to the care with which it must be handled. Were it not for these objections, benzine would be the best of all oil fuels. *Kerosene* is much more suitable for use as a fuel than benzine, because of its portability and the safety and ease with which it can be handled. Roughly speaking, American crude petroleum contains from 50 to 75 per cent. of benzine, and kerosene and Russian crude petroleum contain from 15 to 50 per cent. Peruvian oil is about the same composition as Russian.

The use of kerosene as a fuel is common, but this use is limited by the price of that oil, and its value as an illuminant, to small installations for special purposes. For general industrial purposes, therefore, resort must be had either to the crude petroleum or to the residuum remaining after the kerosene has been distilled off the crude petroleum. In the United States, where the percentage of residuum is so small that its distillation is demanded for lubricating oil, crude petroleum is the only available industrial fuel oil. In Russia, however, the percentage of residuum is so great that only a small portion is required for distillation into machine oil, and the remainder is available for fuel. The residuum is the fuel oil *par excellence*, and in Russia it is used in every possible place. Fuel oils are burned usually in the form of spray, the oil being injected into the furnace through nozzle-like burners by air or steam pressure which breaks it up into fine spray. Their advantages are many, but generally speaking their use must be limited. A few figures will demonstrate the reason for this statement. The coal consumption of the world is probably in the neighborhood of 600,000,000 tons, while that of petroleum is but 17,000,000 tons, of which the greater portion is used for illuminants and lubricating purposes. The amount of petroleum available for fuel purposes is probably, therefore, not more than one per cent. of the coal used. Obviously it cannot be used very extensively as compared with coal. Again, while oil has greater heating value and evaporative efficiency than the best coal, there is always some point where this is counterbalanced by the lesser cost of coal. For example, comparative tests between Lima (Ohio) oil weighing 7.66 pounds per gallon and costing $2\frac{1}{2}$ cents per gallon, and coal giving an evaporation of $7\frac{1}{2}$ pounds of water per pound of coal showed that the two fuels were equally economical when the price of coal was \$3.85 per ton. It must appear from this comparison that the use of oil fuel is limited to countries where coal is high-priced, or to uses where its extra cost is not so important as other considerations, such as lesser bulk, cleanliness, and reduction of labor force. The heating value of fuel oils ranges between about 18,000 and 21,000 B. T. U.

GASEOUS FUELS. For many purposes the best fuel is combustible gas. The ideal fuel is natural gas, but this is obtainable over only a limited area of the earth's surface. Next in value are gases secured by distilling highly gaseous coals or by enriching water-gas. The following are some of the gases which may be used for fuel:

Blast-furnace gas is the gas given off by blast-furnaces for smelting iron ore, and its composition varies with the fuel consumption of the furnace and other conditions. Six analyses made from one blast-furnace by Prof. D. S. Jacobus gave the following average figures: Carbon dioxide, 7.08 per cent.; carbon monoxide, 27.8 per cent.; oxygen, 0.1 per cent.; and nitrogen, 65.02 per cent. The heating value calculated from this analysis was 1175 B. T. U. per pound. At present, blast-furnace gas is more interesting for the possibilities which it offers as a fuel than for the extent to which it is actually used. The quantity of gas which a blast-furnace discharges is much greater than can be used for driving blowing-engines and heating the hot-blast stoves, and this surplus represents a vast waste of fuel which might be utilized were there a demand for it. In modern steel plants some of this waste is saved by installing additional boilers to make steam for the rolling-mills and Bessemer-works. *Coke-retort gas* is the gaseous by-product distilled off coal in making coke. It makes an excellent fuel, but is for the most part wasted in coke-making as practiced in the United States. To secure coke-oven gas for fuel or other purposes special forms of ovens known as retort or by-product ovens must be employed. The gas given off by retort coke-ovens varies in heating value at different stages of the process of coking the coal. According to tests made on retort-oven gas from Cape Breton coal, the heating value increased during the first three hours from 690 to 770 B. T. U. per cubic foot, then it decreased for 18 hours to 630 B. T. U., and then more steadily for 12 hours to 340 B. T. U. There is a wide field for the use of coke-retort gases for fuel, but it has been only slightly worked. *Water-gas* is produced where steam is blown into a bed of white-hot coke; it consists of equal volumes of carbon monoxide and hydrogen or by weight of 28 parts of carbon monoxide and 2 parts of hydrogen. The heating value of pure water-gas is by calculation 343 B. T. U. per cubic foot. A score of years or so ago there was much hope that water-gas could be manufactured and sold extensively as a fuel, but none of the plants established then or since have been commercially successful. It has, however, a field of usefulness in small furnaces in manufacturing plants and in gas-engines. Water-gas enriched by hydrocarbon gases from petroleum or gas-coal has had great success as an illuminant, and is also much used for domestic stoves and cooking-ranges, and in certain of the arts where its convenience counterbalances its cost.

Producer gas, or air-gas, is a mixed gas containing carbonic oxide and hydrogen compounds, and is formed by the incomplete combustion of coal in special retorts or producers. There are a number of producer-gas processes, and the principal ones with the heating values of these products per cubic foot are as follows: Mond, 155 B. T. U.; Siemens, $134\frac{1}{2}$ B. T. U.; Dawson, 160 B. T. U.; Lencauchez, 207 B. T. U. *Retort gas*, or coal-gas, is gas made by distilling coal in closed retorts heated by coke burning beneath them. Before the advent of water-gas, illuminating gas was produced by this process. A typical analysis of coal-gas given by Dr. Gideon E. Moore shows a heating value of 642 B. T. U. per cubic foot. *Oil-gas* is gas made by decom-

posing oil, usually petroleum or its derivatives, by means of heat or steam or by steam and air. Pintsch gas, which is so extensively used for car-lighting, is, for example, made by allowing the oil to fall drop by drop on a highly heated surface, and it has a heating value of about 1320 B. T. U. per cubic foot. Oil-gases resulting from a less perfect process range in heating value in the neighborhood of 870 B. T. U. per cubic foot. *Natural gas* varies in composition and in heating value. The best kinds generally range between 900 and 1100 B. T. U. in value, and the poorest kinds fall as low as 400 B. T. U. Natural gas has been used extensively for domestic purposes, steam-making, glass manufacture, iron-making, brick-making, and for numerous other purposes. Its cheapness has until very recently encouraged wasteful use, with the result that in many places the available supply remaining is very limited.

ECONOMICAL UTILIZATION OF FUEL. The question of the economical use of fuel is one of ever-increasing importance, and is receiving much study by engineers. A high authority, Mr. William Kent, has recently stated the conditions as follows: "A fair estimate of the average cost of coal to the consumer, including transportation charges, is \$2.50 per long ton, which would make the total fuel bill of the United States, in 1899, approximately \$562,757,560. A very large portion of this amount represents a kind of waste that may easily be prevented by means of well-known modern appliances; another portion is waste that is not preventable in the light of our present knowledge; a third is waste that might be saved by the use of appliances which are too expensive to be economically practicable; and a fourth portion is waste that may be saved under some circumstances, and not under others. Examples of the first kind of waste, i.e. that which is easily preventable, are: (1) The use of furnaces for burning soft coal under steam boilers, which are not well adapted to that kind of coal; (2) the discharge of exhaust steam into the atmosphere when all other parts of it might be utilized for heating purposes. An example of the second kind of waste—i.e. that which is not preventable with our present knowledge—is the heat losses in the condensing of water of condensing engines, and in the jacket water of gas-engines. An example of the third kind of waste—i.e. that which may be saved by the use of expensive appliances—is that part of the heat lost in the chimney gases of steam boilers which might be saved by the use of an economizer. An example of the fourth kind of waste, which is preventable under some conditions and not under others, is that of exhaust steam from engines in a factory or other building, which may be utilized for heating purposes in cold weather, but for which there is no use in warm weather."

To the general reader the phase of the subject which is of most direct practical interest is that referring to waste that may be easily prevented by the use of well-known modern appliances. First among these appliances comes the furnace, which if properly designed will insure practically perfect combustion, and if improperly designed will cause a very serious waste of heat-producing fuel. Smokeless combustion of fuel, an important matter in cities, is simply a question of perfect combustion. The second kind of

preventable waste, namely, the discharge of exhaust steam without extracting its useful heat, is less easy to handle. Among the means for saving this exhaust heat are the use of economizers and superheated steam.

A calculation of the possible saving to be accomplished by the use of an economizer has been made by Mr. Kent, as follows:

"Assume a boiler evaporation of 8 pounds of water per pound of coal, and a production of 20 pounds of chimney gas per pound of coal, or 2.5 pounds of gas per pound of water evaporated. If the temperature of the furnace is 2150° F. (a theoretical figure, assuming that there is no direct radiation from the fire to the boiler) and the flue gases are 600° F., the heat wasted in the flue gases will be $600 \div 2150 = 28$ per cent. If by an economizer the temperature of the gases can be reduced to 300° F., half of this waste, or 14 per cent. of the total heating value of the fuel, will be saved. The efficiency of the boiler alone will be 72 per cent. and of the combined boiler and economizer 86 per cent. The gain in economy is $14 \div 72 = 19.3$ per cent. The gain of heat per pound of gas is $300 \times \text{specific heat } 0.24 = 72$ B.T.U., and per pound of water evaporated $72 \times 2.5 = 180$ B.T.U. Also, suppose the feed-water is supplied to the economizer at 100° F. and the steam pressure is 150-pound gauge, corresponding to a temperature of 358° F., and 1213 B.T.U. per pound above 0° F. The heat furnished to the water by the boiler and economizer will be $1213 - 100 = 1113$ B.T.U., of which 180 B.T.U. is supplied by the economizer and 933 by the boiler. The gain in economy is $180 \div 933 = 19.4$ per cent.—a percentage quite possible in practice, provided that there is sufficient heating surface in the economizer and that the feed-water temperature is 100° F., with the gas as hot as 600° F."

After economizers comes the use of steam superheaters. The economy gained by superheating is stated to be from 15 to 20 per cent. with the most economical forms of engines, when the steam is superheated 100° to 150° F. For many purposes the best method of utilizing coal is to convert it into gas, and burn the gas in the furnace, or to grind it to dust, and burn this dust. When all is said, however, the great desiderata in the economical use of fuel are a well-designed and apparent furnace and a similarly perfect boiler.

The literature on fuel and its economical utilization is extensive and widely scattered, but the following two books will be found to meet all the ordinary requirements for information: William Kent, *Steam Boiler Economy* (New York, 1901); Herman Poole, *The Calorific Power of Fuels* (New York, 1898). The following articles in this Encyclopædia may also be consulted with advantage: COMBUSTION; COAL; CHARCOAL; GAS; PETROLEUM; COKE; FURNACES; BOILERS.

FUENTE OVEJUNA, fwān'tā-ō-vā-hōō'nā. A town in the Province of Cordova, Spain, 45 miles northeast of the city of Cordova. It is situated in a well-watered agricultural region. There are deposits of argentiferous lead, calcite, etc., and manufactures of leather, soap, flour, bricks, and tile. The curing of meat is among the industries. In the vicinity are two mineral springs. The parish church occupies the site of the palace of the Knights of Calatrava, to whom the village

was granted by Henry III. in 1430. Some authorities maintain that Fuenteovejuna is the ancient *Mellaria* (named from the abundance of honey). Population, in 1900, 10,717.

FUENTERRABIA, or **FONTARABIA**, fwán'tár-rá-bé'a. A town in the Province of Guipúzcoa, Spain, about ten miles east-northeast of San Sebastian; on the River Bidassoa, near its estuarial expansion (Map: Spain, D 1). It is built on a hill and retains much of the picturesque interest of a ruined mediæval town, though outside of the walls a modern quarter is developing. It has a castle dating from the tenth century, and a pretentious town hall; in the municipal archives are valuable records. Magdalena, situated in the vicinity, is a popular watering-place. The fisheries constitute an important industry; there is some coastwise trade; and particularly in the new quarter manufactures are flourishing. Population, in 1900, 4422. Owing to its position on the French frontier, Fuenterrabia has been the scene of many conflicts between the French and Spaniards, not the least famous of which was the repulse of the Prince of Condé in 1638. It was fortified toward the close of the twelfth century, and in 1524 its defenses were strengthened; but in 1794 the town was captured by the French, and its works were destroyed. In 1813 the Duke of Wellington succeeded in crossing the Bidassoa near Fuenterrabia in spite of the valiant opposition of the French under Marshal Soult. The town played a part also in the Carlist wars of the nineteenth century. Latin inscriptions found in the vicinity gave basis to the theory that this locality was known to the Romans.

FUENTES, fwán'tás, or **FORTE**, fón'tá, BARTOLOME. A Spanish or Portuguese navigator, who is said to have discovered in 1640 a passage uniting the Atlantic and Pacific oceans north of the American continent. An account of this voyage first appeared in a letter published in the *Monthly Miscellany* (London, in 1708), but doubt has been cast upon its authenticity, and by many Fuentes is believed to have been a fictitious personage. The mystery attaching to the affair has led to considerable discussion among scholars. Vancouver admitted the possibility of the discoveries of Fuentes. The real or fictitious discoveries assigned to this navigator have frequently been referred to in works published in Paris and in London, and notably in the book entitled *The Great Probability of a Northwest Passage, Deduced from Observations on the Letter of Admiral del Fonte*.

FUENTES, DON PEDRO HENRIQUEZ D'AZEVEDO, Conde de (c.1535-1610). A Spanish soldier and statesman, born at Zanora. He served in the Netherlands, and under Alva in Portugal, where he commanded the Spanish army in 1589, and defended Lisbon with complete success against the English. From 1591 to 1596 he was civil and military assistant to the royal governors in the Netherlands. About 1600 he was appointed Captain-General and Governor at Milan, where he was incessantly busied with crafty political manœuvres. He has often been confused with another of the name (known to the French as *Fontaines*) who fell at his defeat by the Duc d'Enghien, near Rocroi (May 19, 1643). Consult the life by Duro (Madrid, 1884).

FUENTES DE ONORO, fwán'tás dá ó-nó'ró. A village of Spain, on the Portuguese border, 14 miles west of Ciudad Rodrigo. It is celebrated as the scene of a battle between Wellington and the French under Masséna and Bessières, May 3, 1811. The French, by a furious charge, twice drove back the British lines; but each time the latter, at the point of the bayonet, regained the lost ground. When night came on Masséna retreated, with the loss of about a thousand men. The battle, indecisive in itself, served to keep the French out of Portugal and encouraged the English at home.

FUERO, fwá'ró (Sp., jurisdiction). A term applied in Spain originally to courts of local jurisdiction, and transferred later to collections of laws, or to charters of civic rights granted by kings to individual cities. The most famous were those of Leon and Najera. As these city charters contained, for the most part, special liberties and privileges, the word *fueros* became current chiefly in this sense, and was particularly so applied to designate the body of privileges and liberties that made up the Constitution of Navarre and of the three Basque provinces of Vizcaya, Alava, and Guipúzcoa. These are the *fueros* for the maintenance of which the Basques fought in the Carlist wars of the nineteenth century. The *fueros* of other provinces and cities of Spain have been long extinct. The Basque *fueros* were grounded on the old laws of the Visigoths, and grew up in the period between the irruption of the Moors into the Spanish Peninsula and the consolidation of the Spanish monarchy under the House of Hapsburg. The same was the case in the semi-Basque Province of Navarre, which formed an independent kingdom under its own sovereigns. The *fueros* were thus the product of the ancient Gothic laws and the new circumstances under which they were applied. They resulted by degrees, here as elsewhere, in a struggle between the people and the princes; and their development forms an interesting chapter in the history of modern constitutionalism. They were at first only privileges and statutory rights granted to single places, and from these were extended to others. By the introduction of the representative element of the Cortes and the extension of the *fueros* over whole provinces, they were transformed, in virtue of the general law of custom, into constitutional rights of these provinces, and were in time collected and formally embodied and sanctioned as such. It was in this way that the *fueros* of Navarre, which had been growing into consistency for centuries, were, in 1236, during the contests between King Theobald and his Cortes, collected and recorded, being still extant under the title of *Cartulario del rey Tibaldo*. Ferdinand the Catholic, who united Navarre with the Crown of Castile, maintained the *fueros*, adapting them to the new relations existing with Castile. According to the *fueros* of Navarre, the Cortes, chosen for three years, and consisting of the three estates of clergy, nobles, and commons, met yearly; and without their consent no law could be passed or anything of importance undertaken. The Government consisted of the Viceroy, who presided in the Cortes and Great Council; the Great Council of Navarre, a body similar to the old French Parlements; and the *contaduría*, before which all accounts of revenue and expenditure were laid.

There was no custom-house or toll but at the frontier, and except the trifling grant of 176,000 reals, nothing flowed into the royal treasury. All these fueros the King had to bind himself by oath to maintain.

In the Lordship (*señorío*) of Vizcaya, the fueros grew up in the contests of the inhabitants with their counts. They were first collected into a code by Count Juan in 1371; and this, after the final union of Vizcaya with Castile, was recast, completed, and confirmed by King Charles I. (the Emperor Charles V.). According to this charter of rights, every new 'lord'—this being the title given by the Biscayans to the King of Spain as their prince—on attaining the age of fourteen, must come into the country within a year, and in certain places appointed for that purpose take the oath to uphold the fueros. The Government consisted of a *corregidor*, appointed by the 'lord,' and two deputies; and these, aided by six *regidores*, and forming the *regimiento*, conducted the administration. The supreme power resided in the General Assembly (*junta general*), which met yearly under the tree at Guernica, regulated all the affairs of the lordship, and appointed the deputies and *regidores*. Justice was administered, in the first instance, by the lieutenants (*tenientes*) of the Corregidor; in the second by the Corregidor and his deputies; and in the third, by the Royal Court at Valladolid. Other privileges were, that every Biscayan of pure blood was counted noble; that except the post-office there was to be no royal governing board in the province; that Biscayans were not bound to serve in the Spanish Army. The fueros of Alava and Guipúzcoa were of analogous origin and character, but differed in details. Abolished by Espartero, these fueros were restored by Queen Isabella in 1844. In 1876 a law abolishing the Basque fueros was adopted, and in 1877 a decree was passed assimilating the administration of the Basque Provinces to that of the rest of Spain. Consult: Rivero, *Colección de fueros municipales* (Madrid, 1847); id., *Catálogo de fueros y cartas-pueblas de España* (Madrid, 1852); Mari-chalar y Manrique, *Historia de la legislación civil en España* (Madrid, 1868). See the article BASQUE RACE.

FUERO, JOAQUIN (1814-67). A Mexican soldier. He was born at Guadalupe Hidalgo, and was educated at the Military College of Segovia, at which he subsequently became professor and vice-president. After suppressing the insurrection of 1840 he was, in 1843, appointed chief of staff of the army division in Tamaulipas, and also fought with distinction in the war with the United States, and received a wound from which he ultimately died. Besides a Spanish translation of General Makena's *Treatise on Military Tactics*, he published a *Manual del militar, ó tratado completo de instrucción en la ordenanza* (1842).

FUERTE, fwár'tás, ESTEVAN ANTONIO (1838-1903). An American civil engineer and educator, born at San Juan, Porto Rico. He graduated at the Troy (N. Y.) Polytechnic Institute in 1857, became a member of the royal corps of engineers in Puerto Rico, and in 1862-63 was director of public works for the western district of the island. In 1863 and 1864 he was assistant engineer, from 1864 to 1869 engineer on the Croton Aqueduct Board, and in the latter capacity pre-

pared a valuable report on the connection of the Croton water-supply with the manufactures of New York City. In 1870-71 he was the engineer-in-chief of the United States expedition to Tehuantepec and Nicaragua, to investigate the practicability of a trans-isthmian ship-canal. He became dean of the department of civil engineering in Cornell University in 1873, and from 1890 to 1902 was director of the college of civil engineering, and obtained for Cornell an excellent special equipment for this work. He was a member of the American Society of Civil Engineers and other learned organizations, and published numerous scientific articles and reports.

FUERTEVENTURA fwár'tá-vén-tōō'rá. One of the Canary Islands (q.v.), situated south of Lanzarote, across the Straits of Bacayna (Map: Spain, B 5). Its area is over 650 square miles. There are a number of extinct volcanoes, with a maximum elevation reaching 2800 feet. The soil is only slightly productive, the larger portion being best adapted for grazing. Tree-growth is almost entirely lacking except in the case of a few fruit and nut trees. Population, in 1900, 11,662. Cabras, on the east coast, has a good harbor.

FÜESSLI, fus'lé, or **FÜSSLI**. A Swiss family, originally from Zurich, several members of which were artists. MATTHIAS, called The Old (1598-1665), the first engraver-painter of the family, studied in Italy, and produced some excellent battle-pictures and portraits. A descendant, JOHANN KASPAR (1707-82), also an artist, painted portraits, but is celebrated for his work on Swiss artists, *Geschichte und Abbildungen der besten Künstler in der Schweiz* (1769-79). Another descendant was JOHANN HEINRICH (1742-1825), born at Zurich, and called in England Henry Fuseli. He studied in Berlin, London, and Italy, and finally made his home in London. In 1786 he painted a series of pictures illustrating Shakespeare, and these were followed in 1799 by forty-nine paintings for *Paradise Lost*. His powerful imagination makes these curious works, often purely metaphysical, very interesting; but he was not a colorist, and he never considered the factor of beauty. He became professor at the Royal Academy, and gave some lectures on art which were in many ways remarkable. He wrote a dictionary of painters, some notes on Swiss art, and a study of Michelangelo. An edition of most of his works was published in Zurich (1808).

FUGA, fōō'gá, FERDINANDO (1699-1784). A prominent Italian architect of the Barocco period, born in Florence in 1699. He worked principally at Rome, where his masterpiece is the Corsini Palace. He then went to Southern Italy, and died while engaged in reconstructing the Cathedral of Palermo.

FUGARA, fōō-gá'rá (It., from *fugare*, to flee). The name of a well-known organ stop of four or eight feet pitch, with metal flue-pipes generally of a small scale. The tone has a sharp, 'stringy' quality.

FUGATO, fōō-gá'tō (It., p.p. of *fugare*, to put to flight). A passage consisting of fugal imitations. Only the entrances of the several voices are given. After the first development is completed the composition continues in the free style. See FUGUE.

FÜGER, fū'gër, HEINRICH (1751-1818). A German painter, born at Heilbronn, Württemberg. He was a pupil of Guibal in Stuttgart, and of Oeser in Leipzig. Afterwards he traveled, and spent some time in Rome. In 1806 he became director of the Belvedere Gallery, Vienna. Among his historical paintings are: "The Death of Germanicus" (1789); "The Murder of Cæsar;" "The Farewell of Coriolanus;" "Allegory on the Peace of Vienna" (1801); "Achilles at the Body of Patroclus;" "Apollo and the Muses;" and among his portraits those of the Emperor Joseph II., the Grand Duchess Elizabeth, and Queen Caroline of Naples. He painted in the classic style of the school of David.

FUGGER, fū'gër. A German family of Augsburg, important in Continental financial history. The founder of the family was JOHANN FUGGER, master-weaver in Graben, near Augsburg, about the middle of the fourteenth century, who married Marie Meissner of Kirchheim. His eldest son, JOHANN, acquired by marriage in 1370 the freedom of Augsburg, and began to carry on a trade in linen together with weaving. By a second marriage in 1382, with the daughter of a councilor, he had two sons and four daughters. This Johann Fugger was one of the council of twelve (*Die Zwölfer*), in the weaving guild, and an assessor of the famous Vehmgericht or secret tribunal of Westphalia. He died in 1409, and left a considerable fortune. His eldest son, ANDREAS, made such good use of his share of the inheritance that he was known as 'the rich Fugger.' He founded a noble line, which died out in 1586. Johann's second son, JAKOB, who died in 1469, was the first of the Fuggers who had a house in Augsburg, and carried on an extensive commerce. Of his seven sons, three, ULRICH, GEORG, and JAKOB II., by industry, ability, and integrity, laid the foundation of the princely prosperity of the family. Its members married into the noblest houses, and were raised by the Emperor Maximilian to the rank of nobles. The Emperor mortgaged to them, for 70,000 gulden, the county of Kirchberg and the lordship of Weissenhorn, and received from them afterwards, through the mediation of Pope Julius II., 170,000 ducats, to assist him in carrying on the war against Venice. ULRICH (1441-1510) devoted himself specially to commerce with Austria, and there was hardly an object that did not enter into his speculations. JAKOB (1459-1525) engaged in mining; he farmed the mines in Tyrol, and accumulated immense wealth; he lent to the Archduke of Austria 150,000 gulden, and built the magnificent castle of Fuggerau, in Carinthia. Under Charles V. the house attained its greatest splendor. Jakob having died childless, and the family of Ulrich being also extinct, the fortune of the house rested with the sons of Georg (died 1506), one of whom, MARKUS, entered the Church. The two younger, RAIMUND and ANTONIUS, carried on the business, and became the founders of the two chief and still flourishing lines of the House of Fugger. The two brothers were zealous Catholics, and with their wealth supported Eck in his opposition to Luther. During the Diet held by Charles V. at Augsburg, in 1530, the Emperor lived in Antonius Fugger's splendid house on the Weinmarkt. On this occasion he raised both brothers to the rank of counts, and invested them with the still mortgaged properties of Kirchberg and Weissen-

horn; and a letter under the Imperial seal conferred on them the rights of princes. In 1535 they received the right of coining money. Antonius, at his death (1560), left 6,000,000 gold crowns in ready money, besides jewels and possessions in all parts of Europe and in both Indies. Ferdinand II. confirmed the Imperial letter of Charles V., and conferred additional privileges on the family. The Fuggers continued to carry on commerce, attained the highest posts in the Empire, and several princely houses prided themselves on their alliance with the House of Fugger. They possessed the most extensive libraries and collections of art, maintained painters and musicians, and liberally encouraged art and science. Ulrich, Georg, and Jakob, the sons of the first Jakob, bought houses in one of the suburbs of Augsburg, pulled them down, and built 108 smaller houses, which they let to poor citizens at a low rent. This was the origin of the 'Fuggerei,' which still remains under the same name, with its own walls and gates. Many other benevolent institutions were set on foot by Antonius and his sons. The race is continued in the two principal lines of Raimund and Antonius, besides collateral branches. The domains are chiefly in Bavaria. A collection of portraits of the most important members of this great house, executed by Dominicus Custos, of Antwerp, appeared at Augsburg (1593, et seq.). This collection, increased to 127, with genealogies written in Latin, was republished by the brothers Kilian (Augsburg, 1618), and in 1754 a new edition of the work, still further improved, and containing 139 portraits, was published at Ulm, under the title *Pinacotheca Fuggerorum*. Consult Stauber, *Das Haus Fugger von seinen Anfängen bis zur Gegenwart* (Augsburg, 1900).

FUGITIVE SLAVE LAW. In the history of the United States, the name of two statutes enacted for the purpose of securing to the slave-owners their rights in slaves who had escaped from the State in which they were held in servitude. Such statutes were directed to the enforcement of Article IV., section 2 of the Constitution, which provides that "persons held to service or labor in one State, under the laws thereof," escaping into another, "shall be delivered up on claim of the party to whom such service or labor may be due." The existence of slavery depended entirely upon the sanction of State laws, and could in no way be affected by Federal laws. If, however, slavery was merely a status dependent upon positive enactment, such status ceased when the slave entered a State where slavery was prohibited. On the other hand, if the master's right in the slave was a property right, the situation was quite different. Property rights were defined by State laws, and the protection of such property rights in all other States was guaranteed by the Federal Constitution. Upon the 'property' theory of slavery, it was thus possible to pass such an enactment as that of February 12, 1793. This gave the owner or supposed owner of a fugitive slave the right to seize the alleged fugitive, to take him before any Federal judge or certain local magistrates, and, upon satisfying the judge or magistrates of his ownership, to secure a warrant for removing the slave, or alleged slave, to the State of the owner's domicile. There was no provision for a jury in this preliminary trial; the warrant might be secured

upon the testimony of the owner alone, and a heavy fine was imposed for obstructing the owner or rescuing or concealing the alleged fugitive. The rigor of the act gave opportunity for considerable laxity in its enforcement, and as soon as the controversy over slavery became acute, efforts were made to amend the act or to nullify its effect. A way toward the latter end seemed to be opened by the decision of the Supreme Court in the case of *Prigg against Pennsylvania* (q.v.), in which it was held that the duty of enforcing the statute rested solely upon the Federal authorities. Thereupon various States passed laws prohibiting State officials from assisting in the enforcement of this Federal statute, and forbidding the use of State jails for such a purpose.

The continued and vigorous demands of the South for a more complete recognition of its rights led to the inclusion in the Compromise Measures of 1850 (q.v.) of a new Fugitive Slave Law, the statute of September 18, 1850. This included many features of the old act, and in addition provided for certain commissioners, with jurisdiction concurrent with that of the courts, who received a larger fee in case they decided in favor of the claimant than if they decided in favor of the fugitive. *Ex parte* testimony was sufficient to determine even the identity of the fugitive; the testimony of the alleged slave was expressly barred, and he was denied a jury trial, even after being returned to the State whence he had fled. The enforcement of the law was placed wholly in the hands of Federal officials, and heavier penalties were imposed upon violators of the law. The extreme anti-slavery element in the Northern States soon forced the issue by refusing to recognize the 'finality' of the Compromise of 1850, and by securing the passage of the so-called 'personal liberty' laws. These prescribed heavy penalties for the seizure of free persons, forbade State officials to aid in enforcing the Federal act, and provided that the fugitive should be entitled to a writ of *habeas corpus*, and to a trial by jury. Other requirements of the State laws served to minimize the effect of the Federal statute, and in some cases almost to nullify it. Ten States passed such laws, and thus afforded the South an available ground of complaint. The second Fugitive Slave Law was finally repealed on June 28, 1864. Consult McDougall, *Fugitive Slaves* (Boston, 1891). See SLAVERY; UNDERGROUND RAILWAY.

FUGLEMAN, fū'g'l-mān (from Ger. *Flügelmann*, file-leader, from *Flügel*, wing, file + *Mann*, man). A term more common in Europe than in the United States and used to denote a soldier posted a little in advance of the body of troops of which he is a part, to give the time to his fellows, in the execution of an order entailing more than one distinct movement. Fixing and unfixing bayonets and drawing or returning swords are instances in point. He is usually a flank man, hence the name.

FUGUE, fūg (Fr., from It. *fuga*, fugue, flight, from Lat. *fuga*, flight, from *fugere*, Gk. *φεβγειν*, *pheugein*, to flee, Skt. *bhuj*, AS. *bāgan*, to bend). In music, the name of a composition wherein the parts do not all begin at once, but follow or pursue one another at certain distances; hence the name *fuga*, a flight or chase, each part successively taking up the subject or mel-

ody. Any voice may begin the fugue, but the others follow according to fixed rules. The *subject* is generally a few bars of melody, which is given out in the principal key by the voice which begins. The subject of a fugue should always be short—three or four bars—so that it impresses itself upon the memory, and can be followed and distinguished in the course of the composition. Also, it must *never* be constructed periodically. (See FORM.) After the subject (*dur*) has been announced, the second voice repeats it a fifth above or a fourth below. It is then called the *answer* (*comes*). The first voice meanwhile proceeds with a counterpoint, as does every successive voice upon the completion of the fugue theme. This counterpoint is constructed so as to afford the composer opportunities for ingenious contrapuntal combinations in the further development of the fugue. The third voice follows with the subject again in the principal key, but an octave higher or lower than the first voice, and is answered by the fourth voice in the same manner as the second voice answers the first. When the subject and answer have been introduced in all the parts, the first section or first *development* of the fugue is said to be completed; an episode of a few bars then follows, sometimes in its form like part of the subject, and with a modulation into a nearly related key. The subject and answer are again brought forward, but following in a different order from the first section; while at the same time all the parts are continued, and in some of them the original counterpoint appears either simply or inverted, the subject and answer forming the predominating idea throughout the whole composition.

This is the second development, and is again followed by an episode. The greater the number of voices that are employed in a fugue, the greater will be the number of development sections. A four-part fugue admits of no less than 24 possible development sections; while in a five-part fugue the composer may use any number of developments out of a possible 120. In extended fugues the composer must exercise all his ingenuity on the episodes, otherwise the frequent repetitions of the development section will tire the hearer. Beginning with the third or fourth development, the answer is often given in another interval than the fifth, so as to avoid monotony. Even transposition into other keys is permissible. Masters of the fugue sometimes give the answer in *inversion*, *augmentation*, or *diminution*. (See the separate articles.) The last development is generally an exhibition of all the composer's contrapuntal art. Bach generally closes with a *stretto* (q.v.), where the subject and answer are crowded together, so that the latter begins before the former is completed. Often the *stretto* is elaborated over an organ-point (q.v.). When the subject does not extend in compass beyond the half of an octave, the answer is invariably made in the other half, and to avoid modulation out of the key, the progression of a fifth is answered by a fourth. A fugue consisting of one subject with a counterpoint throughout is called a *strict fugue*.





When a second subject is introduced in the middle of the composition and afterwards worked up with the first subject, it is then called a *fugue on two subjects*.

A *double fugue* begins at once with two subjects in different parts, both of which are strictly treated throughout.

Frescobaldi, Pasquini. It reached its highest development in the eighteenth century, in the works of Bach (instrumental) and Handel (vocal). Bach's fugues have never been equaled, and are, in fact, musical problems of great depth. He devoted a special work to the subject, *Die Kunst der Fuge* (1749). His *Inventionen* and *Das wohltemperirte Klavier* (1722) are necessary to every pianist, and his *Musikalisches Opfer*, elaborated on a theme given to him by Frederick the Great in 1747, are among his best examples. Handel ranks next to Bach. Cele-

There are also fugues with three subjects (*triple fugue*); a famous example is that in the finale of Mozart's C Major (Jupiter) Symphony. A *free fugue* is that in which the subject and counterpoint are not strictly treated throughout, but mixed up with episodes and ideas not connected with the subject. The fugue is not, as has been erroneously believed, a production of German genius. This form was gradually developed from the canonic tricks of the Dutch masters by the great Italian masters of the sixteenth and seventeenth centuries — Merulo,

brated treatises on fugues are by Mattheson, Marpur, Fux, Albrechtsberger, André, Marx, Lobe, Jadassohn, Cherubini, and Fétis.

FUH-CHOW, fŭ'chou'. See Fu-CHOW.

FUH-HI, or **FO-HI**, fŭ'hĕ'. A legendary or semi-mythical chieftain of China, the first of the Wu-ti or 'Five Rulers,' who emerge in succession from the haze of the purely mythical period of Chinese history, and who were succeeded about B.C. 2356 by Yao, with whose reign the Chinese historical classic known as the *Shu King* opens.

The first year of his reign is usually placed in B.C. 2852, though some make it earlier.

Fuh-hi is the reputed founder of the Chinese nation, and is said to have laid the foundations of civilization among a people who were still little better than beasts, eating raw flesh, clothed with the skins of wild animals, pairing promiscuously, and destitute of even the rudest arts of life. He taught them the arts of fishing, hunting, and pasturage, and instituted marriage, dividing the people into 100 families or clans, to which he gave a name, and ordaining that persons of the same clan should not intermarry, a custom observed in China to the present day.

His own surname was *Féng*, 'wind,' and his birth was miraculous, having been carried in his mother's womb for twelve years. Among many other things, he is reputed to have discovered the elements of writing on the back of a tortoise or dragon, which rose from the waters of the Yellow River. From thence he evolved the *Pak-Kwa* (q.v.), or 'eight trigrams,' which by combination and multiplication form the sixty-four hexagrams, on which is based the text of the *Yih-King*, the oldest book in China, and one of the five *King*, or classics. He died in B.C. 2738, and was succeeded by *Shing-Nung*, the 'Divine Husbandman,' who introduced agriculture, and continued the task of civilizing and uplifting his people. Consult: Mayer, *Chinese Reader's Manual* (Shanghai, 1875); La Couperie, *Western Origin of the Early Chinese Civilization* (London, 1894); and Legge, "The Yih-King," in *Sacred Books of the East*, vol. xvi. (Oxford, 1882).

FÜHRICH, fū'rīk, JOSEPH VON (1800-76). An Austrian historical painter and engraver. He was born at Kratzau, Bohemia, February 9, 1800, and studied under Bergler at the Prague Academy, where he became greatly influenced by the literary works of Schlegel and Tieck, designing fifteen plates for the latter's *Genoveva* before going to Rome. In that city he joined the German Pre-Raphaelites, and while there collaborated with Overbeck, Veit, and Koch, in painting the frescoes in the Villa Massimi. They represented illustrations of Dante's *Divine Comedy*, Ariosto's *Orlando Furioso*, and Tasso's *Jerusalem Delivered*, and reveal in their execution the first note of modern German art. Born and bred a country boy, Führich felt the beauty and influence of landscape as a background to biblical subjects, and the study of Dürer made him lean toward the portrayal of patriarchal scenes. His painting of "Ruth and Boaz" is idyllic in its representation, and his "Jacob and Rachel" is similarly treated. In 1841 he was appointed professor at the Academy in Vienna, but continued many of his important works. For his fresco painted in the Church of Altlerchenfeld, a work which occupied the years between 1854 and 1861, he was knighted and received the decoration of the Order of the Iron Crown. Among his works are "Joshua Before Jericho," the "Mourning Jews," "Christ on His Way to the Mount of Olives," "Peter's Draught of Fish," the "Prodigal Son," and "Mary's Journey Over the Mountain," in the Gallery of Vienna, his best work. At the age of seventy-one he illustrated the legend of Saint Gwendolen. Führich died at Vienna. Consult: His autobiography (Vienna, 1875); and the mon-

ograph by his son Lucas (ib., 1886); also Muther, *History of Modern Painting* (London, 1895).

FUJI-SAN, fō'jē-sān'. See FUJIYAMA.

FUJIWARA, fō'jē-wā'rā. The name of one of the most renowned noble families in Japan, eminent in civil affairs, as the Taira and Minamoto were in military, and the Tatchibana were in religious affairs. The founder was Kamatari, Regent of the Empire A.D. 645-49, reputed to be the twenty-first in descent from his heavenly ancestor who served the great-grandfather of the first Mikado. The family was most powerful at Court from the eighth to the twelfth century, and down to the present time has been notably productive of statesmen, artists, poets, authors, scholars, historians, etc. (Consult Mentchikoff, *Empire du Japon*, vol. i., Geneva, 1881, for a list of these.) The Princess Sada, wife of the Crown Prince of Japan, is of the Fujiwara family, of the fortieth generation in descent from Kamatari, the founder, the eighteenth from Tadamitsu, the founder of the Kujo family.

FUJIYAMA, fō'jē-yā'mā (more correctly FUJI-NO-YAMA, or FUJI-SAN; frequently but incorrectly called FUSUYAMA). The highest mountain of Japan, situated in the Province of Suruga, 60 miles west of Tokio, and visible from fourteen provinces, as well as far out at sea; height, 12,365 feet. It is a volcano, with a crater 500 feet deep, and about 2½ miles in circuit. Tradition says that it rose from the plain in a single night, B.C. 285, while at the same moment Lake Biwa (q.v.), near Kioto, was formed. The last recorded eruption began November 24, 1707, and lasted until January 22d of the following year. A hump called Hō-yeizan (9400 feet), noticeable on its south side, was then produced. As the sacred mountain of Japan, it is annually frequented by many thousands of pilgrims from all parts of the empire. Its summit may be reached by five different paths. Shrines and temples are numerous. Fuji-San is the focus of Japanese legend, the frequent theme of the poet, and a familiar object in Japanese art.

Consult: Chamberlain, *Things Japanese* (London, 1892); Griffis, *The Mikado's Empire* (New York, 1900); Satow and Hawes, *Handbook for Travelers in Central and Northern Japan* (Yokohama, 1881); and the ordinary books of travel.

FU-KIEN, fō'kē-en, or **FO-KIEN**, fō'kē-en'; in the local dialect HOK-KIEN. A maritime province of China, bounded on the north by Che-kiang, on the northwest and west by Kiang-si, on the south by Kwang-tung, and on the east by the Formosa Channel; area, 38,400 square miles; population, about 25,000,000; capital, Fu-chow (q.v.). In 1886 Formosa (now belonging to Japan) was detached from it and made a separate province. The general surface is hilly, in some places quite mountainous, especially along its western boundary. The only comparatively level alluvial tracts are found near the mouths of the great rivers, the Min and the Lung, and their numerous tributaries. The soil is fertile and in a high state of cultivation, producing tea, rice, wheat, barley, sweet potatoes, indigo, and sugar. Quantities of timber are obtained from the mountainous districts of the interior, and floated down the Min to Fu-chow, where it is transhipped to Shanghai and other ports. The manufactures are few.

Tea is extensively grown and exported, and it is a noteworthy fact that the first tea imported into England in 1666 (known as Bohea) came from the Wu-yi (pronounced *boo-he*) in this province.

The Province of Fu-kien has long been noted for its production of porcelain. That produced in the Sung Dynasty (960-1280) was originally made at Chien-an Hien, and is described by an author of the eleventh century as being "invested with a soft black glaze flecked with lighter spots, like the fur of a hare." Fu-kien porcelain of the present day is white instead of black, and is produced at the potteries of Teh-hwa Hien, established in the early part of the Ming Dynasty (1368-1644).

Fu-kien was the great centre of the early trade with the Arabs and Sumatra, and is noted historically for its close relations with the Japanese, and its stubborn resistance to Manchu rule. In our day it is noted for its reformers and 'progressives.'

Its two treaty ports are Fu-chow and Amoy (q.v.). In 1899 another port, San Tu Ao (Sam-sah Inlet), further north, was voluntarily opened to foreign trade by the Chinese authorities.

FUKUI, fōō'kōō'ē. The name of seven or more places in Japan, but especially of the chief city of the Province of Echizen, and the ken or prefecture of the same name. Population of the ken, in 1898, 632,580; of the city, 44,290. Fukui is situated on both sides of the Ashiwa River, five miles from the sea. The chief manufacture is habutai, a thin white silk, the production of which in recent years has reached a value of over \$10,000,000. The city is clean and cheerful, and has had a famous history. In the modern renaissance of the nation, Fukui was one of the first educational centres, and it is at once the stronghold of Buddhism and the seat of thriving Christian missions. Consult Griffiths, *The Mikado's Empire* (New York, 1900).

FUKUOKA, fōō'kōō-ō'kā. A prefectural town of Japan, situated on the northern coast of Kiushiu, about 50 miles from Kokura (Map: Japan, B 7). It has a number of fine streets, an old castle now occupied by a garrison, and a public garden. Population, in 1898, 66,190.

FUKUSHIMA, fōō'kōō-shē'mā. A prefectural town of Japan, situated in the Province of Iwashira, 49 miles by rail from Sendai, and 168 miles from Tokio (Map: Japan, G 5). It lies in a very picturesque region, and is an important centre for trade in raw silk and cocoons. Population, in 1898, 20,624.

FUKUYAMA, fōō'kōō-yā'mā. A seaport of Japan, situated at the southern end of the island of Yezo, over 60 miles from Hakodate (Map: Japan, C 6). It was formerly the seat of the lords of Matsumai, and was the chief outlet for the trade of Yezo. Since the abolition of feudalism the town has lost its commercial importance and has been superseded by Hakodate. It contains a number of interesting temples and has an estimated population of 15,000.

FUKUZAWA, fōō'kōō-zā'wā, YUKICHI (1834-1901). A Japanese author and journalist, born in the Province of Buzen. Going to Yedo (Tokio) in 1858, he was so fortunate as to be invited to accompany Katsu Awa in the first Japanese steamer that crossed the Pacific, remaining

several months in the United States. In 1862 he accompanied a Japanese embassy to Europe and improved his opportunity while in London to purchase a library of foreign books and to improve his knowledge of English. In 1866 he published a work, the first of its kind, in several volumes, called *Sei Yō Jijō* (Western Manners and Customs), which became immensely popular and probably did more than any other publication or event to turn the minds of the Japanese toward Western civilization. He again visited the United States, and on his return was appointed an instructor in the Government College in Yedo, where he continued until the civil war in 1868. He then entered upon that systematic course of literary labor by which, through his books and his newspaper, the *Jiji Shimpō*, he has influenced the reconstruction of Japanese literary style. He wrote on an amazing variety of subjects, criticising old Japanese traditions, opinions, and customs, opened lecture halls and helped to form the scholarly Meï Roku Sha, or Society of the Sixth Year of Meïji (1874). On the thirtieth anniversary of the Emperor's accession to the throne, Fukuzawa, having steadfastly declined all offers of Government office as well as a title of nobility, was honored by the Emperor with a gift of 50,000 yen. He died February 3, 1901. Consult Chamberlain, *Things Japanese* (London, 1891).

FULAH, fōō'la (or *Pulo*, plural *Fulbe*). An important Hamite-Negro people on the upper Senegal River in "Futa-Toro and Futa Jallon in compact masses; elsewhere in scattered groups from Senegambia east to Darfur, and south to Adamawa." They are of good stature (1.75 m.) and light brown or copper color, having long heads (index 74.3), Caucasoid features, black and frizzled, but not woolly, hair, and negroid speech. There are four great branches of the Fulah, the *Jel*, the *Baa*, the *So*, and the *Beri*, and many tribes in each. Their name undergoes many changes in the mouths of their neighbors, being variously known as Fula (Mandingan), Fulaji, Fellani (Hausa); Fulata, Fellata (Kanuri); Fullan (Arab); Ufut, Ifulan (Southern Tuaregs); Afellen, Ifellen (Northern Tuaregs); Peul, Poul (French); Fulah (English). In the term Fulah-Zavdeh are sometimes included all peoples resulting from the mixing of Ethiopians with Sudanese Negroes, extending from east to west across the whole of Africa over a belt of five to six degrees in width.

FULBERT, ful'bar' (c.950-1029). A French bishop and scholar. He was a charity student in the school at Rheims under Gerbert, and afterwards was connected with the Church of Chartres. Here he taught, and under his direction the schools of the Academy of Chartres attained a European reputation. In 1007 he was elected Bishop of Chartres. He caused the burned cathedral to be rebuilt (1020), and part of the present edifice dates from his episcopate. He was an active participant in the political affairs of the time, and was on intimate terms with King Robert. His correspondence has been published in volume 141 of the *Patrologiæ* of Migne, and is contained in his *Opera Omnia* (1853). It is a valuable history of those days, and shows the bishop to have been a man of character and piety.

FULCO, or **FOULQUES**, 1061k, of NEUILLY. A famous pulpit orator of the twelfth century, the preacher of the Fourth Crusade. His early life was careless, and his ignorance brought him into contempt in his parish of Neuilly, just outside the walls of Paris. A change came over him, however, and he became an austere ascetic. He commenced a series of journeys as a preacher, exhorting to repentance, and by the rigor of his asceticism enforcing his sermons. He began to preach the Crusade in 1198. In 1201 he asserted that he had induced 200,000 to accept the Cross. He did not live to hear of the result, for he died at Neuilly, March, 1202. Consult Villehardouin, *La conquête de Constantinople*, edited by Wailly (Paris, 1874).

FULDA, ful'dā. The capital of a circle in the Prussian Province of Hesse-Nassau, situated on the river Fulda, 69 miles by rail northeast of Frankfort (Map: Prussia, C 3). The most prominent buildings are the noble cathedral erected at the beginning of the eighteenth century, containing the remains of Saint Boniface; the Church of Saint Michael, consecrated in 822; the old palace of the prince-bishops, and the former Benedictine convent. The Catholic gymnasium of Fulda is believed to be the oldest establishment of its kind in Germany. The manufactures include different kinds of textiles, plush, leather, metal goods, farm machinery, musical instruments, vinegar, and many other important products. Fulda is an important cattle market. Population, in 1890, 13,000; in 1900, 16,900. The town figures in religious history, being especially identified with the life of Saint Boniface, who founded an abbey here in 744. In the eighteenth century it was the seat of a university. It has belonged to Prussia since 1866.

FULDA, MONASTERY OF. One of the most famous of the Benedictine abbeys in Germany. It was founded in 744 by Boniface, the apostle of Germany, who desired to establish safe headquarters for further missionary efforts. A grant of the spot, with four miles of surrounding territory, was obtained from Karlmann, son of Charles Martel. Boniface superintended the clearing of the ground and erection of the building, while his disciple Sturm, destined to be the first abbot, spent a year in Italy, visiting the monasteries, and studying the mode of life pursued at the celebrated Benedictine convent of Monte Cassino. The abbey soon became a centre of education and civilization for the surrounding tribes, and for centuries maintained its position as a place of learning, to which, for example, Alcuin looked for help in his great educational schemes. Many privileges were given to it; in 968 the abbot was made primate of the abbeys of Germany, and he was later created a prince of the Empire. But with the advance in influence and wealth there was an increasing corruption in many of the monasteries, and from this Fulda did not escape. At the beginning of the eleventh century a reform was attempted by substituting new monks from Scotland for the old, and reestablishing in all its strictness the Benedictine rule. The Reformation of the sixteenth century brought discord into the community; but Balthasar von Dermbach (abbot

1570-1606) effected the suppression of the new doctrines. Abbot Schenk von Schweinsberg (1623-32) completed the work of reformation, supported by Pope Urban VIII. In 1626 he brought seventeen monks from Saint Gall to set a good example. With the election of Joachim von Gravenegg, in 1654, the abbey entered upon a new period of prosperity. Benedict XIV., in 1752, created the Abbot Prince Bishop of Fulda. The diocese was secularized in 1802, to be restored, with somewhat different boundaries, in 1829. The buildings of the old monastery were occupied by a clerical seminary, which was one of the first points of attack in the *Kulturkampf* of 1874. Consult: Arnd, *Geschichte des Hochstifts Fulda* (Frankfort, 1862); Hartmann, *Zeitgeschichte von Fulda* (Fulda, 1895).

FULDA, LUDWIG (1862—). A German dramatic author, born at Frankfort-on-the-Main. He studied at Heidelberg, Berlin, and Leipzig, and in 1882 obtained a prize in competition by his one-act verse comedy, *Die Aufrichtigen* (1883). After the appearance of a series of comedies, including *Ein Meteor* (1887) and *Die wilde Jagd* (1888), he assumed the manner of the so-called Berlin School of Realism. In 1893 he won the Schiller prize with his *Der Talisman* (1892), but the Emperor refused to approve the award. Subsequent works are *Jugendfreunde* (1897) and *Die Zwillingsschwester* (1901), an English version of which by Louis N. Parker was presented in America. Fulda's verses are distinguished by their epigrammatic wit and his plays are skillfully contrived. He translated Rostand's *Les Romanesques* and *Cyrano de Bergerac*.

FULGENTIUS, fül-jën'shí-ús, FABIUS PLACIDIUS (c.480-c.550). An African grammarian, of whose life and personality nothing is known save from internal evidence. His style is typically African. Besides a *Liber de Ficticiis Poetarum* and *Liber Physiologus*, both now lost, he wrote: *Mythologicon Libri III.*, with etymological explanations after the manner of Martianus Capella; *Expositio Vergilianæ Continentiæ*, which interprets the Æneid allegorically; a history, *De Etatibus Mundi*; and the very untrustworthy *Expositio Sermonum Antiquorum*, which contains many fictitious quotations. Helm edited *Fulgentii Opera* (1898). His relative Fulgentius (468-533), Bishop of Ruspe, is not to be confused with him.

FULGENTIUS, SAINT, OF RUSPE (468-533). A Latin Christian Father. He was born at Telepte, Northern Africa, of senatorial family. He received a good education, and became first procurator of his province. Disturbed by the turbulence of the times, he retired to a monastery near Telepte. Persecution drove the monks elsewhere, and Fulgentius went to Rome in 500. Returning to Africa, he founded a monastery. He was made Bishop of Ruspe in 508. About 510 he was banished, and again in 515, and suffered other persecutions from the Vandal King Thrasimund (496-523). On the death of the King he was recalled and passed his later years in peace. He died at Ruspe, January 1, 533, and is commemorated on that day by the Catholic Church. Fulgentius was

an ardent admirer of monasticism and a rigorous ascetic; he was recognized as one of the ablest defenders of Christianity against Arianism and Pelagianism. His works are in Migne, *Patrol. Lat.*, lxx. His life by his pupil, Fulgentius Ferrandus (c.540), is contained in Migne, *Patrol. Lat.*, lxxvii. His letters have been edited by Hurter (Innsbruck, 1884). Consult Mally, *Das Leben des heiligen Fulgentius* (Vienna, 1885).

FULGURITE, fŭl'gŭ-rit (from Lat. *fulgur*, lightning, from *fulgere*, to flash; connected with *flagare*, to blaze). A name given to tubes or pipes found in rocks and sands and formed by the actual fusion of these materials by lightning. Such tubes may have a diameter of from one to two inches at the surface, but as they descend in a vertical or oblique direction they branch and rapidly lessen in size. They are commonly found in such regions as are visited by frequent and violent storms, often on mountain peaks.

FULHAM, fŭl'am. A metropolitan borough of London, England, formerly a suburban village, six miles southwest of Saint Paul's Cathedral, on the left bank of the Thames, opposite Putney, with which it is connected by two bridges (Map: London, E 6). Its distinction dates from the reign of Henry VII., when it was chosen as the summer residence of the Bishop of London. The episcopal palace, an extensive brick building, parts of which date from the sixteenth century, stands in fine grounds girded by a moat, one mile in circuit. The parish church, restored in 1881, with a picturesque perpendicular tower of the fourteenth century, contains the tombs of several bishops of London. The borough maintains electric lighting, public libraries, baths, hospitals, and charitable institutions. Population of borough, in 1891, 189,073; in 1901, 249,534.

FULK, FULC, or FOULQUES. The name of several counts of Anjou. **FULK II.** (938-58), called "the Good," is remembered for his saying that "An illiterate king is a crowned ass." **FULK III.**, called "the Black" (972-1040), became count in 987. He was a successful and indefatigable warrior, but was renowned chiefly for his repeated pilgrimages to the Holy Land, whither he went as a penance for his many crimes. **FULK V.**, called "the Young" (1090-1142), became count in 1109. In 1129 he went to Jerusalem, where he married Melisande, the daughter of King Baldwin II. In 1131 he succeeded his father-in-law as King, and reigned until 1143.

FULKE, WILLIAM (1538-89). A Puritan controversialist. He was born in London, graduated from Cambridge, and began the study of law, but gave it up for theology. He became fellow of his college (Saint John's) in 1564, rector of Warley and Dennington in 1569, and master of Pembroke Hall, Cambridge, 1578. He was a Puritan of the most extreme type and particularly delighted in controversy. His *Defense of the Sincere and True Translations of the Holy Scriptures into the English Tongue Against the Cavils of Gregory Martin* (1583); *Stapleton's Fortres Overthrown* (1580); *Rejoinder to Marttall's Reply Against the Answer of Martin Calfhill* (1580); and *Discovery of the Dangerous Rock of the Popish Church* have been reprinted by the Parker Society, with a memoir (Cambridge, 1843-48).

FULLER, ANDREW (1754-1815). An English

Baptist minister, controversial writer, and promoter of foreign missions. He was born at Wicken, Cambridgeshire, February 5, 1754. He received the rudiments of an education at the free school of Soham, and in 1775 was chosen pastor of the Baptist congregation of that place. In 1782 he removed to Kettering, Northamptonshire, to take the pastorate of a congregation there, and remained there till his death, May 7, 1815. His first interest in foreign missions was shown in 1784, and his sermon, *The Gospel of Christ Worthy of All Acceptation* (Northampton, 1785), greatly impressed Carey, the first Baptist missionary. When the Baptist Missionary Society was formed at Kettering in 1792, he became its secretary, and gave the remainder of his life to its affairs. His writings were very popular; they include: *The Calvinistic and Socinian Systems Examined and Compared as to Their Moral Tendency* (1794); *The Gospel Its Own Witness* (1799); *An Apology for the Late Christian Mission to India* (1808). There are several editions of his collected works. For his biography, consult: Rylands (London, 1816); T. E. Fuller (London, 1863); and A. G. Fuller (London, 1882).

FULLER, ARTHUR BUCKMINSTER (1822-62). An American Unitarian clergyman. He was born at Cambridgeport, Mass., graduated at Harvard College in 1843, and studied theology in the Harvard Divinity School. He was a teacher and preacher in Illinois, and pastor at Manchester, N. H., Boston and Watertown, Mass. He volunteered in the Federal Army in the Civil War, was made chaplain in a Massachusetts regiment, and was killed at Fredericksburg. He was a brother of Margaret Fuller (Marchioness d'Ossoli), and edited several of her works (1855). Consult: R. E. Fuller (his brother), *Life of Arthur B. Fuller* (Boston, 1863), and a sketch by Higginson in *Harvard Memorial Biographies*, vol. i. (Cambridge, Mass., 1866).

FULLER, GEORGE (1822-84). An American figure, portrait, and landscape painter, born at Deerfield, Mass. From 1836 to 1838 he was in Illinois with a party of civil engineers, and was associated with Henry Kirke Brown, the sculptor. Returning to Deerfield, he completed his education in four years, giving considerable attention to portrait painting. In 1842-43 he studied with Brown in Albany. He spent several years in Boston, portrait painting, then removed to New York, and continued his studies at the Academy. He was elected associate of the National Academy in 1867, upon an exhibition of a portrait of his first master, Henry Kirke Brown. He went South for three years, making many studies of negro life. In 1860 he went to Europe. He returned to Deerfield, where he combined his interests as an artist and farmer. In 1876 he exhibited fourteen pictures in Boston which were received with enthusiasm. This was followed by frequent exhibitions at the Academy. In 1879 Mr. Fuller showed the "Romany Girl," and "She Was a Witch." In 1880, the "Quadroom"; and in 1881, the loveliest of all his works—the "Winifred Dysart." "Turkey Pasture in Kentucky" is one of his finest examples. The subjects of Fuller's pictures are extremely simple, conceived in a pictorial spirit. His landscapes are not so much definite pictures of localities as idealized studies of color, light, and foliage, with a poetic expression of sun and

shadow. He preserved all the large lines of form, sacrificing the minor details to the beauty of the whole. The essence of his art was selection. Fuller was the forerunner of a new tendency in art, that of the Idealistic School.

FULLER, HENRY BLAKE (1857—). An American novelist and story-writer, born in Chicago. His first story, *The Chevalier of Pensierivani*, was published anonymously, won favor in the eyes of Professors Norton and Lowell, and, on its republication (1892), became popular. In the same year appeared *The Chatelaine of La Trinité*. Both were remotely romantic. *The Cliff Dwellers* (1893) was an essay in relentless realism. This picture of Chicago life was followed by another, *With the Procession* (1895), kindlier in touch, with humor playing over its seriousness, and *Sicilian Romance* (1900). He has also written twelve one-act plays collected in *The Puppet Booth*.

FULLER, LOIE. An American actress, noted for her invention of the 'Serpentine Dance.' She was born near Chicago, and as a child appeared at the Academy of Music there. Subsequently she appeared in a variety of characters (including Ustane in *She*) before devoting herself to her specialty. She has in recent years resided chiefly in Paris, where she has appeared at the Folies-Bergère, and in 1900 in a theatre of her own.

FULLER, MELVILLE WESTON (1833—). An American jurist, born in Augusta, Me. He graduated at Bowdoin College in 1853, studied at the Harvard Law School, began legal practice at Augusta in 1855, and was also there for a time an associate editor of *The Age*, a Democratic newspaper. In 1856 he was president of the Augusta Common Council and city attorney, but in the same year resigned his offices and established himself at Chicago, Ill. He was a member of the Illinois State Constitutional Convention of 1862, and in 1863 sat in the Lower House of the Illinois Legislature. In 1864, 1872, 1876 (when he placed T. A. Hendricks in nomination), and 1880, in which year he withdrew from active politics, he was a delegate to the Democratic National Convention. As a lawyer he attained prominent rank, and in 1888 he was appointed by President Cleveland Chief Justice of the United States Supreme Court, to succeed M. R. Waite (q.v.), deceased. His term witnessed an expansion of the Federal powers by means of the decision asserting the implied authority of the Executive to protect the Federal judges on occasions when there is just reason to believe that, while in the exercise of official duties, they are exposed to personal danger. In 1899 he was a member of the Arbitration Commission convened at Paris for the adjustment of the Anglo-Venezuelan boundary question. The degree of LL.D. was conferred upon him by Harvard in 1891.

FULLER, RICHARD (1804-76). An American clergyman. He was born in Beaufort, S. C., studied at Harvard, was admitted to the bar, and subsequently entered the Baptist ministry. From 1846 until his death he was pastor of the Seventh Baptist Church in Baltimore. He published *Letters on the Roman Chancery; Correspondence on Domestic Slavery; and Baptism and Communion*. Consult Cuthbert, *Memoir of Richard Fuller* (New York, 1879).

FULLER, SARAH MARGARET (OSSOLI) (1810-50). An American critic and essayist, born at Cambridgeport, Mass., May 23, 1810. The eldest of the eight children of Timothy Fuller, a Massachusetts lawyer and politician, she was strenuously educated by her father, by Dr. Park of Boston, and in the Misses Prescott's School of Groton, beginning Latin at six and Greek at thirteen, and permanently injuring her health by over-application. On the death of her father (1835) she supported her brothers and sisters by public and private teaching in Boston and Providence. She was a frequent guest at Brook Farm, though never sharing its enthusiasms, held intellectual conversations in Boston, conducted the Transcendental organ, *The Dial* (1840-42), made translations from the German, and published in 1844 her first volume, *Summer on the Lakes*, the record of a season of travel in 1843. In December (1844) she went to New York as literary critic of the *Tribune*, taking active part in the philanthropic, literary and artistic life of the city. In 1846 she went to Europe, residing for some time at Rome, where she married (December, 1847) Giovanni Angelo, Marquis d'Ossoli, by whom she had one child. She took an active part in the Italian struggle for independence, and served heroically in the hospitals during the French siege of Rome. On its capture (July, 1849) she took refuge with her husband first in the mountains of Abruzzi, then at Florence, and on May 17, 1850, sailed for America, but with her husband and son was drowned off Fire Island Beach just as they were approaching New York on July 16.

Her life falls naturally into three periods. Till 1844 she lived an intense life seeking self-culture in the exciting stimulation of the Transcendental circle. The two years from 1844 till her visit to Italy are those of original literary production. *Women in the Nineteenth Century* (1844) and *Papers on Literature and Art* (1846) are its monuments. Her activities in Rome found a literary expression in a book on the Roman Republic, the manuscript of which was lost with her. With all her tact and brilliancy, she was not an original genius; she needed the inspiration of an audience, talking better than she wrote. Her *Letters* are, therefore, the most readable of her works, and the position that she held in Boston and in New York is hardly to be understood from her writings. It was a natural instinct that led her to select for translation Eckermann's *Conversations with Goethe* (1839) and *The Correspondence of Fräulein Gündert and Bettina von Arnim* (1840-42). The impression that she made upon the circle of her intimates is attested by three notable biographies, for which consult: Emerson, Clarke, and Channing (Boston, 1852); Julia Ward Howe (ib., 1883); and Thomas Wentworth Higginson (ib., 1884). There is also a *Memoir* by her brother, Arthur B. Fuller (Boston, 1855).

FULLER, THOMAS (1608-61). An English author and divine. He was born at Aldwincle, Northamptonshire, of which parish his father was rector, and was educated at Queen's College, Cambridge, graduating A.B. in 1625 and M.A. in 1628. Two years later he was appointed to the curacy of Saint Benet's. The next year he was collated to a prebend in Salisbury Cathedral, and in 1634 he was appointed to the rectory of

Broadwindsor, Dorsetshire. Abandoning both his living and his prebend in 1641, he settled in London, where he soon became curate of the Savoy, a church in the Strand. In the meantime he had published an account of the Crusades, entitled *History of the Holy War* (1639), and the *Holy and Profane State* (1642), the most characteristic of his works. During the Civil War he adhered firmly to the Royal cause, and shared in its reverses. He was a chaplain in the Royal army, when he wrote for the encourage-

Cretaceous beds, and it was at one time considered so valuable that its exportation from England was prohibited under severe penalties. A variety of fuller's earth, known as cimolite, occurs in the island of Argintiera, Greece, and has been mined since ancient times. More recently fuller's earth deposits have been discovered near Quincy, Fla.; Fairburn, So. Dak.; and at other localities in the United States. The following analyses of fuller's earth show the composition of the material: 1 is from Reigate,

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	Na ₂ O	K ₂ O	H ₂ O	Moisture
1.....	52.81	6.92	3.78	7.40	2.27	.....	.74	14.27	.....
2.....	62.83	10.35	2.45	2.43	3.12	.20	.74	7.72	6.41

ment of his men a manual of prayers and meditations entitled *Good Thoughts in Bad Times* (1645), and a sequel, *Better Thoughts in Worse Times* (1647). About 1648 he was presented to the living of Waltham, in Essex. In 1650 he published a geographical account of the Holy Land, entitled *A Pisgah Sight of Palestine and the Confines Thereof*, with maps and views. In 1655 appeared *The Church History of Britain, from the Birth of Christ Until the Year 1648*. In 1658 he received the living of Cranford, Middlesex, and at the Restoration he was reinstated in his prebend of Salisbury, of which he had been deprived by the Parliamentarians. He was also appointed Chaplain Extraordinary to the King. He died in London. The next year (1662) appeared *The Worthies of England*, valuable for the information it contains on provincial history, and abounding in biographical anecdote, witty remark, and acute observation on men and manners. Quaint humor is one of Fuller's peculiar characteristics; but his writings are no less remarkable for wisdom, imagination, and, when occasion demands, even for pathos. Consult Bailey, *Life of Thomas Fuller, with Notices of his Books*, etc. (London, 1874).

FULLER-MAITLAND, JOHN ALEXANDER (1856—). An English writer on music, born in London. He graduated at Trinity College, Cambridge, in 1879, and, after having contributed for a number of years to the London papers, became in 1889 music critic of *The Times*. He wrote many articles for the *Dictionary of National Biography*, for *Grove's Dictionary of Music and Musicians* (the appendix of which he edited), and for some of the leading periodicals. He also wrote a standard life of Schumann in the "Great Musicians Series" (1884); *Master of German Music* (1894); *The Musician's Pilgrimage: A Study in Artistic Development* (1899); and was joint translator with Clara Bell of Spitta's *Life of J. S. Bach* (1884). In addition he compiled a number of collections of music:

FULLER'S EARTH (AS. *fullere*, from Lat. *fullo*, fuller). A material resembling clay in appearance, but commonly lacking plasticity. It is fine-grained, of variable color, and has a specific gravity of from 1.8 to 2.2. It derives its name from the fact that its principal use once was for fulling cloth and wool, that is, cleansing these materials of grease. At the present day a much more important application is for clarifying cottonseed and lubricating oil, by filtering them through the earth, which absorbs the impurities. Fuller's earth was originally mined only in England, especially at Nutfield, near Reigate, in Surrey, where it occurs in

England, and 2 from Quincy, Fla. The output of fuller's earth in the United States in 1900 was 11,813 short tons, valued at \$70,565. Consult: "Mineral Resources of the United States," issued by the *United States Geological Survey* (Washington, annually).

FULLER'S THISTLE. See TEASEL.

FULLERTON, Lady GEORGIANA (1812-85). An English novelist and philanthropist, daughter of the first Earl of Granville. She was born at Tixall Hall, Staffordshire, and in 1833 married Alexander Fullerton. In 1844 she published her first novel, *Ellen Middleton*. Her second work, *Grantley Manor*, was written in the interest of the High Church party. In 1846 she entered the Roman Catholic Church, and afterwards published a number of controversial novels, chief among which are: *Lady Bird* (1852); *Too Strange Not to be True* (1864); and *Constance Sherwood* (1865). After 1854 she devoted much time to charity. Consult Coleridge, *The Life of Lady Georgiana Fullerton*, translated from the French of Mme. Augustus Craven (London, 1888).

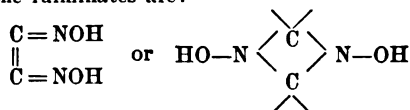
FULMAR (special use of *fulmar*, *fulmart*, *foulmart*, polecat, from AS. *fúl*, Eng. *foul* + OF. *marte*, Fr. *martre*, from OHG. *mardar*, Ger. *Marder*, AS. *mearps*, Eng. *marten*). Any of several species of strictly oceanic petrels. (See PETREL.) The common northern fulmar (*Fulmarus glacialis*), the 'malle-muck' of sailors, is a bird about the size of a duck, gray above, white beneath; head, neck, and tail pure white; bill yellow; the young are brownish gray. It inhabits the most northern seas, in which its numbers are prodigious, breeds on the rocky shores of the Faroe Islands, Iceland, Greenland, Spitzbergen, etc., on the grassy shelves of the precipices, making a slight nest or a mere excavation, in which it lays one egg. It is rarely to be seen on the United States coast south of Massachusetts, or on the southern coasts of Great Britain, but breeds in great numbers in Saint Kilda and adjacent islets. It is extraordinarily abundant about these isles, and is of importance to the inhabitants of Saint Kilda, who esteem its eggs and flesh above those of any other bird, and gather them in the most perilous manner, descending by ropes from the summit of the precipices. The fulmars are also valued for their feathers, down, and oil; the last is one of the principal products of Saint Kilda, and is obtained from their stomachs. The old are said to feed the young with it, and when they are caught or assailed these birds lighten themselves by disgorging it. It is amber-colored, and

has a peculiar and nauseous odor. Fulmars feed on all animal substances which come in their way, giving an evident preference to fat and delighting in the blubber of whales. Another important species is the giant fulmar (*Ossifraga gigantea*), notable for its size, which equals that of a small albatross. It is found in the Pacific Ocean, and is known to sailors as 'bone-breaker,' because of the observed crushing power of its great hooked beak. The slender-billed fulmar (*Fulmarus glacialis*) is a very widely ranging form which occurs on the Alaskan coast of Bering Sea. It is of the same size as the common fulmar, but the bill is much longer and more slender. Several of the fulmars are remarkable for their dichromatism. See Plate of FISHING BIRDS.

FULMINE OF MERCURY (from Lat. *fulminare*, to lighten, from *fulmen*, lightning, from *fulgere*, to flash), or FULMINATING MERCURY, $C_2HgN_2O_2 \cdot \frac{1}{2}H_2O$. A highly explosive crystalline organic compound, sparingly soluble in cold water, freely soluble in hot water. It is obtained by dissolving mercury in an excess of nitric acid, and gradually adding the solution to alcohol. The operation is attended with considerable danger and should not be conducted in the neighborhood of flames, as the vapors evolved during the reaction are very inflammable. On cooling, fulminating mercury separates out in crystalline form. When moist, it may be handled without much danger; but when dry, it explodes with violence if struck by a hard body or if heated. Mixtures of fulminating mercury with nitre or with chlorate of potash are employed as the primary of percussion caps.

FULMINE OF SILVER, or FULMINATING SILVER, $C_2AgN_2O_2$. A chemical compound, prepared by heating an aqueous solution of silver nitrate with nitric acid and alcohol. It is more powerfully explosive than the fulminate of mercury; for even if it is moist or under water, pressure with a hard body will cause its explosion; and when it is quite dry, the slightest friction between two hard bodies produces a similar result.

FULMINATES. A term applied to a class of salts having the same percentage composition as the cyanates, but, unlike them, exploding violently when heated or struck. There are many fulminates, corresponding to the different metals. The preparation of the fulminates is attended with very considerable danger and should not be attempted by inexperienced persons. The structural formulas at present usually assigned to the acid ('fulminic acid,' $C_2H_2N_2O_2$) combined in the fulminates are:



This acid has not yet been isolated in the uncombined state.

FULMINIC ACID. See FULMINATES.

FULTON. A city in Whiteside County, Ill., 36 miles northeast of Rock Island, on the Mississippi River, and on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, and the Chicago, Burlington and Northern railroads (Map: Illinois, B 2). It is the seat of the North-

ern Illinois College, opened in 1865. There are manufactures of lumber, clay pipe, stoves, metal roofing and siding, etc., and an extensive trade in grain, lumber, and produce. Population, in 1890, 2099; in 1900, 2685.

FULTON. A city and the county-seat of Callaway County, Mo., 120 miles west of Saint Louis, on the Chicago and Alton Railroad (Map: Missouri, E 3). It is the seat of the State Institution for the Deaf and Dumb, State Lunatic Asylum No. 1, Westminster College (Presbyterian), founded in 1852, Synodical College, and Conservatory of Music for Young Ladies, founded in 1874, and the William Woods College of the Christian Church of Missouri. The city has an extensive supply of coal and fire-clay of excellent quality, and manufactures fire-brick and pottery of various kinds. Settled in 1821, Fulton was incorporated in 1859, the charter of that date being still in operation. Its government is administered by an annually elected mayor and a council elected on a general ticket. Town meetings are held monthly to discuss topics of general civic interest. The city owns and operates its water-works and electric-light plant. Population, in 1890, 4314; in 1900, 4883.

FULTON. A city in Oswego County, N. Y., 25 miles northwest of Syracuse, on the Oswego River, the Oswego Canal, and the New York Central, the Lackawanna, and the New York, Ontario and Western railroads (Map: New York, D 2). It has a public library. The city carries on an extensive trade in cheese, and there are manufactures of flour, woolen goods, paper pulp, firearms, tools, pocket cutlery, butchers' supplies, excelsior, water-motors, ensilage and straw cutters, paper-mill machinery, condensed milk, canned goods, etc. Population, in 1890, 4214; in 1900, 5281. Fulton was settled about 1791, and was first incorporated in 1835. In April, 1902, the villages of Fulton and Oswego Falls, with an aggregate population of 8206 (census of 1900), were consolidated and chartered as a city, the government of which is administered by a mayor and common council. The water-works are owned and operated by the municipality.

FULTON. The first steam war vessel, designed by Robert Fulton, and built in New York in 1815. The *Fulton* was a vessel of 38 tons, provided with central paddle-wheels. She was accidentally blown up in 1829.

FULTON, JUSTIN DEWEY (1828-1901). An American clergyman. He was born in Earlville, N. Y.; graduated at Rochester University in 1851, studied in the Rochester Theological Seminary, and was ordained in 1854 to the Baptist ministry in Saint Louis, where he was editor of the *Gospel Banner*. Subsequently he had pastoral charges in Sandusky, Ohio; Albany; Boston; Brooklyn, N. Y.; and Montreal, Canada. Among his works are: *Roman Catholic Elements in American History* (1859); *Woman as God Made Her* (1867); *Rome in America* (1884); *Radicalism*; and *The Sabbath*.

FULTON, ROBERT (1765-1815). A celebrated American engineer, born at Little Britain, Pa., of Irish parents, who were in such poor circumstances that all the education young Fulton acquired was the ability to read and write. He made good use, however, of his opportunities and passed in study the time allowed him for recrea-

tion. At an early age he was apprenticed to a jeweler in Philadelphia, and in addition to devoting himself to this trade, he applied himself to painting. The sale of his portraits and landscapes enabled him, in the space of four years, to buy a small farm, on which he placed his widowed mother. At the age of twenty-two he proceeded to London, where he studied painting under Sir Benjamin West; but after several years thus spent he abandoned painting to devote himself wholly to mechanics. Some works that he executed in Devonshire obtained for him the patronage of the Duke of Bridgewater and of the Earl of Stanhope. In 1794 he obtained from the British Government a patent for an inclined plane, the object of which was to displace canal locks, and in the same year he invented a mill for sawing and polishing marble. His next invention was a machine for spinning flax, followed by one for making ropes. He was received as a civil engineer in 1795, and wrote a work on canals, in which he developed his system and ideas. Accepting an invitation from the United States Minister at Paris, he proceeded to that city in 1796, and remained there for seven years, devoting himself to new projects and inventions. Among the inventions developed here was the *Nautilus*, or submarine boat, carrying torpedoes, invented to be used in naval warfare; but he was unable to secure its adoption by either the French, British, or United States Government. He next turned his attention to a subject that had frequently occupied his mind before, and about which he had written a treatise in 1793, viz. the application of steam to navigation.

In 1803 he constructed a small steamboat, and his experiments with it on the Seine were attended with great success. The French Government, however, did not give him any encouragement, but he had the coöperation of Robert Livingston, the Minister of the United States to France, who assisted Fulton in his experiments. Returning in 1806 to New York, Fulton superintended the construction of a larger steamship provided with an English engine. In 1807 he launched the *Clermont* upon the Hudson, which started off on her trip to Albany in the presence of thousands of astonished spectators. At the beginning the average speed was only about five miles an hour, which was considered a great achievement. From this period steamers, for the use of which on the waters of New York State Fulton and Livingston were granted a monopoly by the Legislature, came into general use upon the rivers of the United States. Although Fulton was not the first to apply steam to navigation, as a steam-vessel had been tried upon the Forth and Clyde Canal as early as 1789, and by Rumsey and Fitch in America in 1786-87, yet he was the first to do so with any degree of success. His reputation as an engineer and inventor was now firmly established, and he was employed by the United States Government in the execution of various projects with reference to canals and other engineering works. In 1814 he obtained the assent of Congress to construct a steam-frigate, which was launched in the following year. Though the labors of Fulton were attended with such great success, various lawsuits in which he was engaged in reference to the use of some of his patents prevented him from ever becoming

wealthy; and anxiety, as well as excessive application, tended to shorten his days. His death in New York, February 24, 1815, produced extraordinary demonstrations of mourning throughout the United States. He married, in 1806, a niece of Robert Livingston, United States Minister to France. His published works included: *A Treatise on the Improvement of Canal Navigation* (1796); *Letters on Submarine Navigation* (1806); *Torpedo War* (1810); *Letter to the Secretary of the Navy on the Practical Use of the Torpedo* (1811); *Report on the Practicability of Navigating with Steamboats on the Southern Waters of the United States* (1813); *Memorial of Robert Fulton and Edward P. Livingston in Regard to Steamboats* (1814); *Advantages of the Proposed Canal from Lake Erie to the Hudson River* (1814). Consult: Thurston, *History of the Growth of the Steam Engine* (New York, 1878); Colden, *Life of Robert Fulton* (New York, 1817); Reixart, *Life of Fulton* (Philadelphia, 1856); Knox, *Fulton and Steam Navigation* (New York, 1886).

FULVIA. Daughter of M. Fulvius Bambalio of Tusculum. She married first P. Clodius, and their daughter afterwards became the wife of Octavianus (Augustus). In B.C. 44 she married Marcus Antonius, with whom she was deeply in love, and into all whose ambitious plans she entered with enthusiasm. Cicero was murdered in 43, and when his head was brought to Antonius, Fulvia is said to have pierced with her needle, in vindictive spite, the tongue that had uttered so many reproaches against her husband. But Antonius in the East fell into the snares of Cleopatra, and Fulvia attempted to stir up a riot in order to secure his recall to Rome, but failed and was banished from Italy. At Athens Fulvia and Antonius met, and he reproached her so bitterly for her part in political affairs that she retired to Sicyon in despair, and died there shortly after (B.C. 40).

FUMAGE (OF. *fumage*, ML. *fumagium*, fuel, from Lat. *fumus*, smoke). In the law of England, a chimney tax, commonly called smoke-farthing. This tax is mentioned in Domesday as paid by custom to the King for every chimney in the house. Edward, the Black Prince, is said to have imposed a tax of a florin for every hearth in his French dominions. The first statutory enactment on the subject in England is 13 and 14 Car. II., ch. 10, whereby a tax of 2s. on every hearth in all houses paying to Church and poor was granted to the King forever. This tax was abolished in 1689.

FUMARIA'CEÆ (Neo-Lat. nom. pl., from *Fumaria*, from Lat. *fumus*, smoke). An order of herbaceous plants with watery juice; alternate, much divided leaves; calyx of two deciduous sepals; corolla of four very irregular, white, yellow, pale red, crimson, or purplish petals; stamens sometimes four and distinct, more generally six, and in two bundles; ovary free, one-celled, one-seeded, or many seeded; and seeds with large albumen. Botanically, the Fumariaceæ are regarded as most nearly approaching the Papaveraceæ (poppy, etc.); but their general aspect is very different, and they do not possess the same powerful properties. More than one hundred species are known, mostly natives of temperate climates in the Northern Hemisphere, some of great beauty in both flower and foliage. Bleeding-heart (*Di-*

centra spectabilis), a native of China, is a well-known favorite in gardens and greenhouses. Several species of *Dicentra* and *Corydalis* are natives of America. The common fumitory (*Fumaria officinalis*), a rather delicate and beautiful weed of frequent occurrence in gardens and fields, is an annual of easy extirpation. Its leaves, which have an intensely bitter, saline taste, were formerly much employed in medicine as a tonic and diaphoretic, and although disused in America, are still esteemed in France as a remedy for scorbutic affections, chronic eruptions, etc. Some other species are credited with anthelmintic, anti-periodic, emmenagogue, and similar properties, but except in household or in foreign medicine they are now little used.

FUMARIC AND MALEIC ACIDS (from Neo-Lat. *Fumaria*, the type of the herbaceous order Fumariaceæ). Two organic substances having not only the same composition and molecular weight ($C_4H_4O_4$), but the same chemical constitution ($COOH \cdot CH : CH \cdot COOH$), yet differing considerably in both their chemical and physical properties. Fumaric acid crystallizes in fine needles and sublimes without melting and without decomposition at $200^\circ C$; at higher temperatures it is converted into the anhydride of maleic acid; and it is sparingly soluble in water. Maleic acid crystallizes in rhombic prisms that melt at $130^\circ C$, and if heated to 160° , loses the elements of water and is converted into maleic anhydride; it is readily soluble in water. Both fumaric and maleic acids may be obtained by heating malic (oxy-succinic) acid. Maleic acid is, however, more conveniently prepared by distilling the acetyl derivative of malic acid. Both fumaric and maleic acids readily form addition products with the halogens and are therefore classed with the unsaturated compounds. The relation between the two acids is explained by the modern stereo-chemical theory, according to which the atomic groups composing their molecules, though the same in kind and number, are in two cases differently arranged in space. See STEREO-CHEMISTRY.

FUMBINA, foom-bě'ná. See ADAMAWA.

FUMIGATION (from *fumigate*, from Lat. *fumigare*, to fumigate, from *fumus*, smoke). The cleansing or medicating of the air of an apartment by means of vapors, employed chiefly for the purpose of destroying odors or disinfecting the room, as well as clothing, furniture, etc. (See CONTAGION; INFECTION.) Most of the methods of fumigation formerly employed have little real value, and are to be looked on chiefly as grateful to the senses; as, for instance, the burning of frankincense, camphor, etc. The really active processes are noticed under DISINFECTANTS. The application of fumes of medicines to the respiratory tract is also called fumigation. For this purpose fumes of tobacco, stramonium, nitrate of potash, muriate of ammonium, and various gums are employed.

FUNCHAL, foon-shál' (Port., place of fennel). The capital of Madeira, situated on the southern side of the island. It is a picturesque and well-built town, and contains a cathedral, an opera house, and a museum. Its streets are mostly narrow, and, owing to their steepness, sleds, drawn by oxen, and sometimes luxuriously fitted up, take the place of wheeled vehicles. The

principal streets are lighted by electricity. The harbor, which is well fortified, is not very safe, but it is the only port in Madeira for ocean-going steamers. Funchal is the seat of the government and a bishop. Owing to its mild climate, the town has come into prominence as a health resort. The neighboring mountains present magnificent scenery. Population, about 19,000.

FUNCK - BRENTANO, fúnk'brán'tá'nó', THÉOPHILE (1830—). A French philosopher, born at Luxemburg. He studied law and medicine in France and abroad. In 1893 he became professor at the School of Political Sciences, in Paris. His works include: *Les sciences humaines* (1869); *La civilisation et ses lois* (1876); *Nouveau précis d'économie politique* (1887); *La logique de Port-Royal et la science moderne* (1891); *L'homme et sa destinée* (1895); *La science sociale, morale, politique* (1897), and he translated and published Bismarck's correspondence (1883).

FUNCKE, foon'ke, OTTO (1836—). A German Protestant theologian. He was born at Wülfrath, near Elberfeld, and was educated at Halle, Tübingen, and Bonn. After holding positions in various parts of Germany he began in 1868 to preach at the Friedenskirche, Bremen, where he also published a great number of devotional works which have made him widely known. Among these are: *Christliche Fragezeichen* (14th ed. 1896; Eng. trans. by E. Sterling under the title *Self Will and God's Will, or How to Discover what is God's Will in the Perplexing Question of Life*, 1887); *Reisebilder und Heimatklänge*, three series (1869, 14th ed. 1896; 1871, 8th ed. 1899; 1872, 6th ed. 1893); *St. Paulus zu Wasser und zu Land* (8th ed. 1891); *Die Welt des Glaubens und die Alltagswelt* (9th ed. 1895); *Gottes Weisheit in der Kinderstube* (5th ed. 1890). His collected works were published in 1893.

FUNCTION (from Lat. *functio*, use, from *fungi*, to employ, Skt. *bhuj*, to enjoy, to be useful). The specific physiological processes of a part or organ. In the ameba all the functions of the organism are performed by the same protoplasmic mass. In higher forms, both plant and animal, where division of labor is established, certain parts take in water, digest food, or excrete waste for the benefit of the whole body. This assumption of particular function by certain parts must necessarily involve great changes in form and structure of the organism. Any subsequent change in function that an organ may undergo brings about far-reaching changes in structure. Many organs, like the liver and the brain, have many functions. Some of these functions we speak of as primary, others as secondary. Thus the primary functions of an insect's wing is locomotor, while secondarily the wing may serve in respiration. What are secondary functions may at times or in certain animals become primary; thus the allantois is an unimportant bladder in frogs; in birds and reptiles it is the chief fetal respiratory organ, while in many mammals it forms part of the placenta. With the change in function, and consequently in form and structure, are correlated changes in various other organs; hence any change in one organ is of far-reaching importance to the whole organism.

FUNCTION. A mathematical term due to Leibnitz (1692), but first defined in its present sense by Johann Bernoulli (1718). In this sense a function is a quantity whose value depends upon that of another quantity. E.g. in the formula for the circumference of a circle, $c = 2\pi r$, c depends upon r for its value; c is therefore said to be a function of r . Likewise, in the equation $y = x^2 + 2x + 3$, the value of y depends upon the value of x , so that if $x = \dots -2, -1, 0, 1, 2$, etc., $y = \dots 3, 2, 3, 6, 11$, etc.; y is therefore a function of x , and this is expressed by the symbol $y = f(x)$, which was first employed almost simultaneously by Euler (1734) and Clairaut. Instead of $f(x)$ other symbols are often used, as $F(x)$, $\phi(x)$, $\psi(x)$, etc. In $y = f(x)$, the value of y depending upon that of x , x is called the *independent* and y the *dependent* variable. In a function like $y = ax + b$, y is called an *explicit* function of x ; in the expression $x^2 + 2xy + b = 0$, y is an *implicit* function, and this is indicated by the symbols $f(x, y) = 0$. In the same way we may have $f(x, y, z) = 0$, $f(x_1, x_2, \dots, x_n) = 0$, or we may have $z = f(x, y)$, $y = f(x_1, x_2, \dots, x_n)$. If a function has only one value for each given value of the variable, it is called a *uniform* (monodromic, monotropic, *eindeutig*) function, as in the case of $y = x^2 + 2x + 3$. But if a function has more than one value for any given value of the variable, or if its value can be changed by modifying the path in which the variable reaches that given value, the function is said to be *multiform* (polytropic, *mehr-*

deutig), as in the case of $y = \sqrt{x}$. If the equation $y = f(x)$ be solved for x , then x will equal some function of y , i.e. $x = \phi(y)$, and the latter function is called the inverse of the former. E.g. in the case of a sphere $v = f(r) = \frac{4}{3}\pi r^3$, and $r = \sqrt[3]{\frac{3v}{4\pi}} = \phi(v)$,

$v = f(r)$ and $r = \phi(v)$ being inverse functions.

Functions were classified by Leibnitz as algebraic or transcendental. The former are such as include only the four fundamental operations together with the use of constant exponents, their simplest forms being $a + x$, ax , $\frac{a}{x}$, x^a , and their most general form being

$$\frac{(a + bx + cx^2 + \dots)^m}{(a' + b'x + c'x^2 + \dots)^{m'}}$$

In the broadest sense we say that y is an *algebraic* function of x when $A_0y^n + A_1y^{n-1} + A_2y^{n-2} + \dots + A_{n-1}y + A_n = 0$, where A_i is a polynomial in x of the form $A_i = a_0x^m + a_1x^{m-1} + \dots + a_{m-1}x + a_m$. The *transcendental* functions include all other functions, to which, from the domain of the common operations, powers with variable exponents, the so-called *exponential* functions and their inverse, *logarithms*, chiefly belong.

An important class of transcendental functions is known as circular functions. These include the goniometric functions, $y = \sin x$, $\cos x$, $\tan x$, $\cot x$, etc. (see TRIGONOMETRY), and their inverses, the *cyclometric* functions, $x = \sin^{-1}y$ or *arcsin*, etc. It is shown in trigonometry that $y = \sin x = \sin(x \pm 2k\pi)$, where k is any integer, so that x may be increased or decreased by $2\pi, 4\pi, 6\pi, \dots$ without altering the value of

y ; the function is then called *simply periodic*. In the inverse function, $x = \sin^{-1}y$, x evidently may have, for any value of y , an infinite number of values; this function is therefore called *infinitely multiform*. The inverse exponential function (i.e. the logarithm) and the circular function are integrals of algebraic functions. Thus,

$$\int \frac{dx}{x} = \log x, \int \frac{dx}{\sqrt{1-x^2}} = \sin^{-1}x,$$

$$\int \frac{dx}{1+x^2} = \tan^{-1}x, \int \frac{dx}{x\sqrt{x^2-1}} = \sec^{-1}x,$$

etc., all with the proper constants.

If a function $y = f(x)$, or $\phi(x, y) = 0$, be plotted, the figure is a curve with infinitely many points in immediate succession. The continuity of the curve and, corresponding to it, the continuity of the function, consist in this, that any two successive points lie infinitely near each other, so that an infinitely small variation of the abscissas is attended by an infinitely small variation of the ordinates. This suffices to explain what is meant by a *continuous* function, the meaning of the term *discontinuous* function being easily inferred. E.g. the functions $a + x$, ax , a^x , $\sin x$, $\cos x$, are continuous in the domain $(-\infty, +\infty)$ of the variable x , as is also x^n when n is a positive integer. The functions \sqrt{x} , $\log x$ are continuous in the domain $(0, +\infty)$.

The function $\frac{a}{x^n}$, where n is a positive integer, is continuous in the domains $(-\infty, 0 - \epsilon)$, $(0 + \epsilon, +\infty)$, however small ϵ may be; but for $x = 0$ it breaks its continuity and $y = \pm \infty$.

The term 'theory of functions' was first used by Lagrange (*Théorie des fonctions analytiques*, Paris, 1797). The branch thus denoted deals with functions of more general form than those described above. E.g. in the equation $w = f(z)$, z must, in general, be taken to be a complex number (q.v.), $x + yi$, where i stands for $\sqrt{-1}$. The theory, therefore, has for its object the study of functions of one or more variables, in which either the variables or the coefficients, or both, are complex numbers. This general theory may be said to have been founded by Lagrange (1772, 1797, 1806), although Newton, Leibnitz, Johann Bernoulli, Clairaut (1734), D'Alembert (1747), and Euler (1753) had already worked toward it. Gauss contributed to the theory, especially in its application to the fundamental theorem of algebra. Cauchy, starting from Lagrange's work, greatly developed it, and numerous propositions due to him are found in the various text-books on the subject. His memoirs extend over a period of nearly forty years (1814-51), covering a large part of the general theory as known to-day, and placing the subject upon a firm foundation. The historical development after Cauchy's time becomes interwoven with that of special functions, notably the elliptic and Abelian.

Elliptic functions arose from the consideration of the integral $\int \frac{Rdx}{\sqrt{X}}$, where R is a rational $f(x)$, and X is the general rational and integral quartic $a_0x^4 + a_1x^3 + a_2x^2 + a_3x + a_4$. The theory of these functions had been suggested by Jakob Bernoulli (1691) and by Maclaurin (1742), and D'Alembert (1746) had approached it. Euler

had gone further (from 1761) and had prophesied (1766) that there would come "a new sort of calculus of which I have here attempted the exposition of the first elements." To Landen (1775), however, the honor is usually given of founding the theory. But it is to Legendre that its real development is due. He worked forty years in perfecting it, his labor culminating in his *Traité des fonctions elliptiques et des intégrales Euleriennes* (1825-28). At the same time that Legendre published this work, Abel and Jacobi began their great contributions. Abel, whose fundamental theorem was not published until after his death, discovered the double periodicity of elliptic functions. Jacobi created a new notation and gave name to the 'modular equations' of which he made use. Cayley contributed to the subject in England, his only book being devoted to it.

The general theory of functions has received its present form largely from the works of Cauchy, Riemann, and Weierstrass. Endeavoring to subject all natural laws to mathematical interpretation, Riemann attacked the subject from the standpoint of the concrete, while Weierstrass proceeded from a purely analytic point of view. Riemann's theories have been elaborated by Clebsch, and also by Klein, who has materially extended the theory of Riemann's surfaces, and who has generalized Clebsch's application of modern geometry to the study of elliptic functions in his *Theorie der elliptischen Modulfunctionen*. This last-named theory had its origin in a memoir of Eisenstein (1847), and in the lectures of Weierstrass on elliptic functions.

In the theory of functions, the number of special functions is very great. For the list at the present time, consult: Müller, "Mathematische Terminologie," in *Bibliotheca Mathematica* (Leipzig, 1901), where some two hundred are mentioned. The most notable work on the historic development of functions is that of Brill and Noether, "Die Entwicklung der Theorie der algebraischen Functionen in älterer und neuerer Zeit," in *Jahresbericht der deutschen Mathematiker Vereinigung*, vol. ii. (Berlin, 1894). For theory, bibliography, and historical notes, consult: Harkness and Morley, *Theory of Functions* (New York, 1893); and Forsyth, *Theory of Functions* (Cambridge, 1893). For further bibliography of historical development, and for articles on the theory of functions, consult Merriman and Woodward, *Higher Mathematics* (New York, 1896).

FUNCTION CHANGE. The disuse of an organ for one function, and its modification for the performance of another; thus an organ may be transformed into another homologous with it, but performing a different function, serving a quite different use. It originates in a series of functions performed by one and the same organ. Of these several functions one is the chief or primary, while the rest are secondary. If the primary function is for any reason suppressed, some one of the secondary functions becomes the chief one, and the final result of these processes is the transformation of the organ.

As an example may be mentioned the change of function in the anterior limbs of certain crustaceans from swimming and breathing uses to organs of mastication (mandibles, maxillæ, and maxillipeds), the outer division, or 'expodite,'

undergoing reduction from disuse. Thus the original or chief function is suppressed, and what was an accessory or minor function becomes the chief one. More apparent examples are the change from the five-toed legs of the reptilian ancestor of birds into the wings, and of the fore legs of the ancestors of whales into the paddles of existing cetaceans. All such changes of function are the result of change of environment, of habits, and of instincts.

Still another good example of the principle of change of function is afforded by the swimming-bladder of fishes. This in most fishes is a closed sac lying directly beneath the backbone. In the gar-pike it has acquired a connection by a duct with the throat. It then becomes an accessory breathing organ in such fishes as the *Protopterus* of Africa, which is able temporarily to live out of water. Finally, by further change in habit and structure, this bladder with its pneumatic duct has become transformed into the lung of the amphibians, reptiles, and higher vertebrates. The transformation is due to change of surroundings and of habit, resulting in the changes of function.

This principle is pure Lamarckian doctrine; i.e. that changes of surroundings and of habits bring about changes of function or use, and finally of structure. Yet there are very numerous examples of this principle, and it has been most active in the origination of the classes and orders of animals.

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FUNCTUS OFFICIO (Lat., discharged from duty or authority). A phrase applied to something which, having formerly had legal vitality and force, is without any further validity or authority. When an agent or officer has fulfilled the duty assigned him, his office is *functus officio* and his powers are at an end. The same is true of legal instruments which have been duly executed, and have been used for the purpose for which they were created, or on which a judgment has been entered. Thus a warrant of attorney on which a judgment has been entered is *functus officio*, and a second judgment cannot be based upon it. So, also, a bill of exchange paid by the drawee, or passed by him to the credit of the drawer, is *functus officio*, and cannot be further negotiated.

FUNDAMENTAL NOTE (from Lat. *fundamentum*, base, from *fundare*, to found, from *fundus*, bottom). In music, the root or fundamental tone upon which a triad is built. Thus C is the fundamental note of the triad C E G, and remains so in all inversions of the chord; whereas the lowest note is the bass note. Thus in these combinations C E G, E G C, G C E, C is always the fundamental note, while the bass notes are C, E, G, respectively.

FUNDAMENTALS OF CHRISTIAN DOCTRINE. A term much used in Protestant theological discussion, but very difficult to define. It has been said that the fundamental Christian doctrines are those which it is necessary to believe in order to attain salvation. But this logically

involves conclusions concerning the condemnation of large classes of individuals which men, particularly in the later time, shrink from accepting. A distinction has been drawn between truths necessary to salvation and the degree of knowledge necessary in an individual in order that he may be saved. That is, a truth may be necessary to salvation, yet an individual who does not know it may not be condemned, it being assumed that he would believe it if he knew it. It is not involuntary ignorance of the truth, but rejection or denial of it, that results in condemnation. Hence the fundamentals vary for individuals, and it is impossible to draw up a certain definite list which shall hold good in all cases. Another definition would make the fundamental Christian doctrines those which are the essential characteristics of Christianity, differentiating it from other religions. All Christians consider certain truths essential to the Christian system, and others as comparatively unessential. But each Christian body has doctrines essential to its own system which are not held by the entire Christian Church. And a distinction must be made between doctrines fundamental to Christianity and those fundamental to a particular system; that is, between the essential characteristics of a Christian and the criteria of membership in a particular body. Adherents to the various bodies do not always find it easy to draw this distinction, and the best attempts to state the former in terms of doctrine almost inevitably prove unsatisfactory because of the natural tendency to include the latter. In general, however, there is a practical tendency toward agreement between the different Protestant churches, whatever differences there may be upon specific points in their statements of fundamentals of doctrine. And such agreement is increasingly recognized. Modern Protestantism denies that saving faith is an exercise of the intellect; it is an action of the will in respect to what is known. And the characteristics of Christianity are to be found in the sphere of conduct rather than in belief. Roman Catholic theologians claim that they do not use the expression.

The discussion of fundamentals in doctrine has had importance chiefly in attempts to unite the various Christian bodies, particularly the Lutheran and Reformed churches. It was actively carried on in Germany in the early post-Reformation period. In England a committee of clergymen was appointed in 1653 to draw up a list of 'fundamentals' and report to Parliament. Richard Baxter, who was one of the committee, proposed that it should consist of the Apostles' Creed, the Lord's Prayer, and the Ten Commandments. A catalogue of sixteen articles was adopted, however, including doctrines concerning God, Christ, divine worship, faith, sin, the resurrection, the judgment, everlasting life and everlasting condemnation. The aim seems to have been to exclude rather than to furnish common ground for agreement.

FUNDI, fūn'dī, or **FUNDUNGI** (West African word). A kind of grain, *Paspalum exile*, much cultivated in the west of Africa. It is allied to the millets, and still more nearly to some of the kinds of grain cultivated in India. It is wholesome and nutritious, and has been recommended as a light and delicate food for invalids. The

natives of Western Africa throw it into boiling water, pour off the water, and add palm-oil, butter, or milk. In Sierra Leone it is much used with stewed meat, and sometimes made into porridge with milk. See **PASPALUM**.

FUNDY, BAY OF (from Fr. *fond de la baie*, head of the bay). An arm of the Atlantic, separating Nova Scotia from New Brunswick and the State of Maine (Map: Nova Scotia, D 4). With an average breadth of 35 miles, it extends 180 miles in length from northeast to southwest. It forks, at its head, into two inlets, the northern, called Chignecto Bay, and the southern, Minas Channel, which are divided by narrow necks of land from the Gulf of Saint Lawrence. Along its northwest side it receives the Saint John, the principal river of New Brunswick, and the Saint Croix, which, through its entire course, forms the international boundary. The navigation is rendered perilous by the peculiarity of the tides, which have a rise and fall of 53 feet at certain seasons, and produce dangerous bores in the upper reaches. The shores present a very bare appearance at low tide, with long expanses of mud flats and in-reaching estuaries completely drained.

FÜNEN, fy'nēn (Dan. *Fyen*). The largest of the Danish islands after Zealand, situated between the Great and Little Belts (Map: Denmark, D 3). It is about 50 miles long and over 40 miles in its greatest width, with an area of over 1100 square miles. Its surface is slightly elevated in the south and west, where it rises to an altitude of over 400 feet. The larger part, however, is flat. The soil is fertile and well watered. Grain is produced and considerable amounts are exported. The raising of domestic animals is also extensively carried on. Administratively the island forms, together with the adjacent islands of Langeland and Ærø, and a number of smaller islands, the province or stift of Fünen, which is divided into the two bailiwicks of Odense and Svendborg. The principal towns are Odense (q.v.), the capital, Svendborg, and Nyborg (q.v.). The population of the province in 1890 was 256,827; in 1901, 279,501.

FUNERAL, THE, or **GRIEF À-LA-MODE**. A comedy by Steele, acted in 1701. Hazlitt calls it "trite, tedious, and full of formal grimace."

FUNERAL RITES. See **MORTUARY CUSTOMS**.

FUNES, fū'nās, GREGORIO (1749-1830). An Argentine historian. He was rector of the University of Córdoba, and as such introduced numerous reforms. He was highly distinguished as a lecturer, and counted among his pupils many men afterwards famous. He was also celebrated as an historian and pulpit orator, and in the latter capacity was probably unexcelled in his day in South America. His qualifications ultimately secured for him an appointment to the deanship of the Cathedral of Córdoba. His chief publication is entitled *Ensayo de la historia civil del Paraguay, Buenos Ayres y Tucumán* (1816).

FÜNFKIRCHEN, fūnf'kērk-en, or **PÉCS**, capital of the County of Baranya, Hungary, and an important garrison town, 248 miles southeast of Vienna by rail. It is picturesquely situated on the southern vine-clad slopes of the Mecsek Mountains. It has been the see of a Roman

Catholic bishop since 1009, and has a handsome twelfth-century Romanesque cathedral with four towers, which has been restored since 1887. Three of the five Turkish mosques from which the town derives its German and Hungarian names are in ruins, but the remaining two are now respectively the Stadtkirche and a Franciscan church. Other important buildings are the episcopal palace, the town hall, and a fine synagogue. There is a considerable trade in coal, marble, wine, fruit, tobacco, gall-nuts, and hogs; and it has important manufactures of leather, cloth, and pottery. Fünfkirchen is thought to be the Roman *Colonia Serbinum*. It was occupied by the Turks from 1543 to 1686. Population, in 1890, 34,067; in 1900, 43,982.

FÜNG-HWANG, or **FENG-HWANG**, füng'-hwäng'. A fabulous Chinese bird which figures largely in Chinese poetry, art, and folk-lore. *Füng* is the male and *hwang* the female, and as the two are inseparable they are considered models of conjugal love. The füng-hwang is the second of the four supernatural creatures of Chinese mythology, and has many symbolical analogies to the Greek phoenix. It is immortal, lives in the highest air, and its appearance on earth presages the advent of a virtuous monarch, or is emblematic of a prosperous reign. It appeared several times in antiquity. In China it is the special emblem of the Empress; in Japan (where it is called Hō-wō), of the Mikado. In art it is usually depicted with the head of a pheasant, the beak of a swallow, a long flexible neck, plumage of many gorgeous colors, a flowing tail, and long claws pointed backward as it flies. Each of the five colors of its plumage typifies one of the five cardinal virtues. The flowers usually associated with it are sprays of the tree-peony. Consult: Mayer, *Chinese Reader's Manual* (Shanghai, 1875); and Griffiths, *The Mikado's Empire* (New York, 1900).

FUNGI, fūn'jt (Lat., mushrooms; connected with Gk. σφγγος, *sphongos*, σπγγος, *spongus*, sponge). A group of non-chlorophyll-bearing plants. They constitute the second division of the thallophytes (the lowest primary division of plants), and because they lack the green coloring matter, chlorophyll, or pigments related to chlorophyll, they are forced to live as parasites on living plants and animals, or as saprophytes on dead organisms or their products. As stated under ALGÆ, the fungi are believed to have been derived from that group, and to have arisen at different times from several stocks; in other words, the fungi constitute a polyphyletic group. Consequently, the fungi do not present a continuous series of related forms. On the contrary, there are at least two lines (Schizomycetes, Myxomycetes) which have little resemblance either to one another or to the great body of higher fungi, except through a general similarity of physiological processes. Indeed, in some classifications the name fungi is restricted to the higher forms, whose bodies are usually made up of filaments. It seems probable, however, that the terms fungi and algæ will be given a more general application, as a matter of convenience, and cease to have special significance in classification.

The fungi include five large classes: Bacteria (Schizomycetes), slime-molds (Myxomycetes), alga-like fungi (Phycomycetes), sac-fungi (As-

comycetes), and toadstools and their allies (Basidiomycetes). A sixth class, the yeasts (Saccharomycetes), is much smaller than the others. The habits and some of the striking peculiarities of these groups are discussed in special articles under the above names. This article considers points of morphology with especial bearing on classification, and includes an account of certain biological principles.

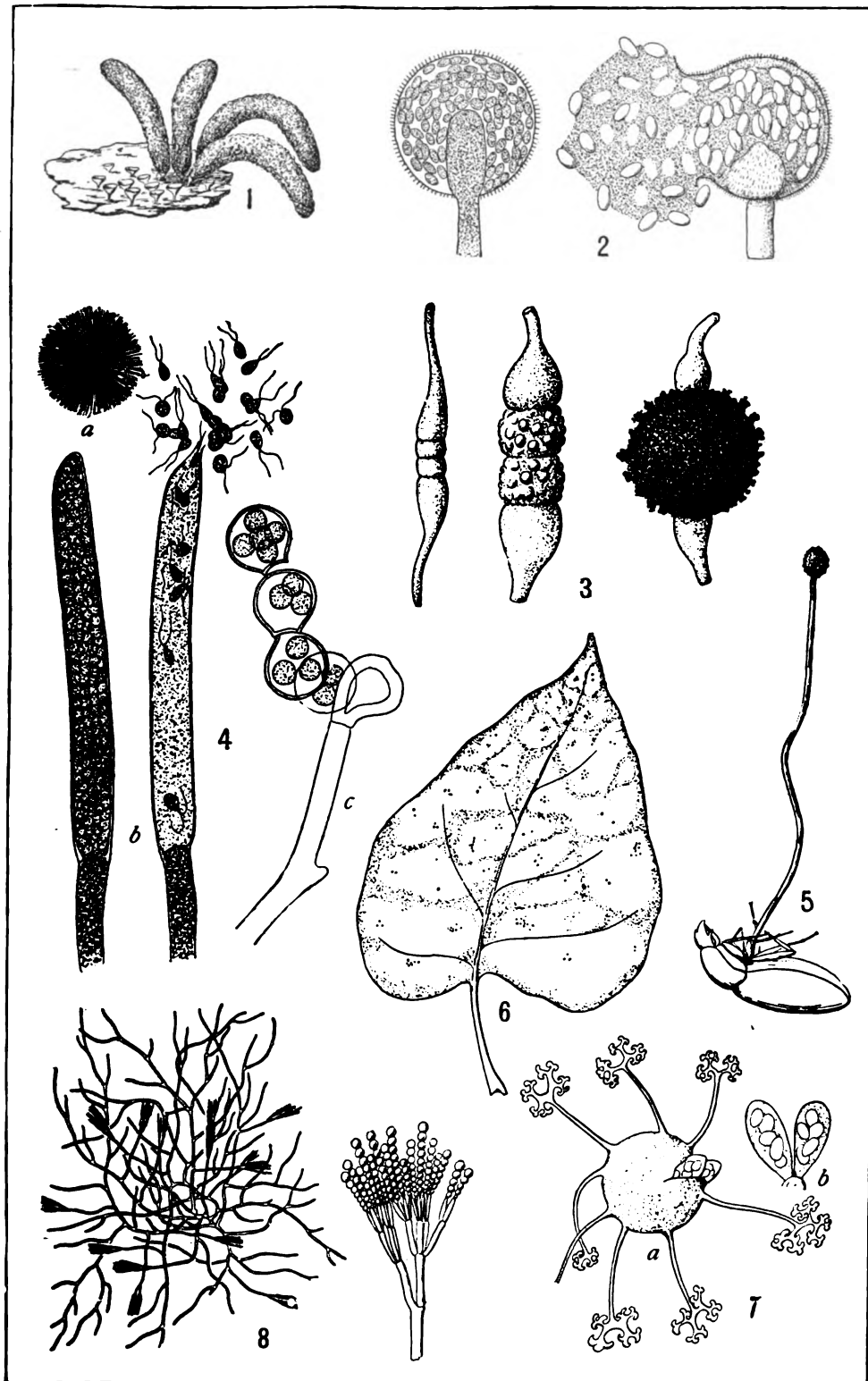
SCHIZOMYCETES. The Schizomycetes (Bacteria) present the same simplicity of cell structure as do the Cyanophyceæ (blue-green algæ). It is doubtful if they ever have a well-defined nucleus—the most conspicuous cell organ. There is likewise a resemblance to the blue-green algæ in many points of cell arrangement, and in the general character of the higher filamentous forms. These resemblances have led to a very generally accepted view that the Bacteria have come from the blue-green algæ under the influence of an environment that encouraged saprophytism (living on dead organic material). A group, called the Schizophytes, has been proposed to hold both these lowest groups of the algæ and fungi. However, some botanists relate the Bacteria to certain Flagellata (q.v.).

MYXOMYCETES. The Myxomycetes (slime-molds) occupy a position quite apart from other fungi. The plasmodium phase (the ordinary slimy body) has no parallel in the life histories of other groups, and there is no condition comparable to a mycelium (a thready body). Indeed, the vegetative period of the life history of a slime-mold is wonderfully animal-like. But the fructification resembles that of plants, in that there is developed a complex spore-case (sporangium), frequently stalked, containing thousands of reproductive cells essentially like the spores of fungi. There is likewise a capillitium, a plant-like device of a fibrous network, which by expanding and contracting aids in distributing the spores. The substance of the sporangium wall and of the capillitium is, in part, cellulose (the peculiar substance of the cell-walls of plants).

Setting aside the Bacteria and the slime-molds, there is left the vast assemblage of fungi whose working body is usually made up of hyphæ (filaments) more or less closely united with one another, the entire mass being called the mycelium.

PHYCOMYCETES. In the Phycomycetes (alga-like fungi) there is a very interesting assemblage of types almost all presenting some alga-like characters, but sufficiently diverse from one another to suggest that there may have been several points of origin. The most alga-like are the water-molds (Saprolegniales) and the downy mildews (Peronosporales). Here, in addition to the cœnocyctic body (see CœNOCYTE), similar to that of the Siphonales among the algæ, there are present swimming spores produced in terminal spore-cases, and sexual organs (oögonia and antheridia) very similar to those of Vaucheria. One genus (*Monoblepharis*) has motile sperms, but in the other types the male organ (antheridium) puts out a tube that enters the female organ (oögonium) and discharges some of its contents. There is to be noted among these forms a tendency to give up some of the alga-like characters. Thus, in certain of the downy mildews (Peronosporales) the organ cor-

TYPES OF FUNGI



1. SPORE CASES OF A SLIME MOULD.

2. SPORANGIA OF BLACK MOULD.

3. DEVELOPMENT OF ZYGOSPORE OF BLACK MOULD.

4. WATER MOULD, (a) growing on a fly; (b), Sporangia with Zoospores; and (c), Oospores and eggs.

5. SPORE CASE OF CORDYCEPS (An Insect parasite).

6. MILDEW ON LILAC.

7. LILAC MILDEW, Showing (a) Ascocarp; and (b), Ascus with spores.

8. GREEN MOULD WITH SPOROPHORES.

responding to the spore-case has ceased to produce swimming spores, but has become itself an aerial reproductive cell (conidia, q.v.). In the water-molds (*Saprolegniales*) sexuality has so degenerated that the male organs, although frequently present, are rarely, if ever, functional. The *Chytridiales* include many one-celled forms whose life history presents a continuous alternation of motile and non-motile conditions, reminding one of the life histories of some of the green slimes (*Protococcales*) among the algae. It has been suggested that the *Chytridiales* have come from the *Protococcales*, a group of algae much lower than the ancestors of the downy mildews and the water-molds. It is possible, however, that the *Chytridiales* are degenerate forms of higher fungi. The common black molds (*Mucorales*) have less of the algal characters than other *Phycomycetes*, but the terminal spore-cases and sexual organs recall the downy mildews. The *Entomophthorales* are a highly specialized group of insect parasites whose relationships are very obscure.

ASCOMYCETES. The *Ascomycetes* (sac-fungi) present structures and life histories that are very difficult to correlate with those of the *Phycomycetes*. Some of the lower forms are undoubtedly sexual. There is present a female cell (ascogonium or archicarp) fertilized by a discharge from a neighboring male cell (antheridium), the condition recalling at once that in the downy mildews. The fertilized female cell, however, develops a special system of filaments that finally produce the characteristic spore-containing sacs (asci). These filaments are generally associated with sterile portions of the original body to form a fructification called the ascocarp. The ascocarp may be compared to a similar growth (cystocarp) produced from the fertilized egg of the red algae (*Rhodophyceæ*). The subject becomes further complicated, however, by an apparent tendency among the *Ascomycetes* to give up sexuality. In some higher groups repeated investigations have failed to demonstrate sexual organs, and the ascocarp in consequence probably develops without a sexual act. There have been attempts to homologize the ascus (spore-sac) with the sporangium (spore-case) of the black molds, assuming that the large and variable number of spores in the latter structure became reduced and fixed to eight, the usual number in the former. Later studies upon the development of the spores, however, indicate that the two structures are not related. It is then possible that the ascus is a special form of spore-case peculiar to the *Ascomycetes*. There are a number of peculiar forms of spores in the *Ascomycetes*, developed at various periods in the life history, manifestly for purposes of distribution. They have been named conidia, pycnidia, etc. There are a great many fungi known only through some fructification of this character. For convenience they are placed in a group called the *Hyphomycetes* or *Fungi Imperfecti*. Most of the *Hyphomycetes* are believed to be imperfect forms of *Ascomycetes*, but among them there are also large numbers of species that undoubtedly belong to other groups. There are practical reasons for this artificial group, as many of the species are economically important. Studies in their life histories are constantly bringing to light phases which determine their place among the

natural groups, so that species are constantly being removed from this artificial assemblage.

BASIDIOMYCETES. The *Basidiomycetes* (mushrooms, toadstools, etc.) are a remarkable class. There is no trace of sexuality in the group, not even the vestiges of sexual organs which generally remain even when plants reproduce without them. Apart from certain peculiar phenomena of fusing nuclei, there are no clues to the problem of the origin of the group. The diverse orders are held together by a phase common to all the life histories, namely, the basidium, which is the swollen tip of a filament bearing spores on slender branches. It has been found that this basidium of the toadstools and the puffballs is represented by the promycelium of the smuts (*Ustilaginales*, q.v.) and rusts (*Uredinales*, q.v.). This promycelium arises from the winter spore (teleutospore), which is essentially only a resting spore to tide the parasite over an unfavorable season. There are kinds of rusts (*Leptopuccinia*) in which the teleutospores form promycelia directly upon the host plant, and these conditions resemble strikingly the basidia of certain toadstool forms. The winter spore (teleutospore) of the rusts and the smuts is then merely an adaptation related to the parasitic habit, and unnecessary for saprophytes such as the toadstools, bracket fungi, and puffballs. It must not be supposed, however, that there is only one conspicuous line of development among the *Basidiomycetes*, for there are several divergent lines, prominent among which are the rusts (*Uredinales*), smuts (*Ustilaginales*), and certain orders of the toadstools (*Hymenomycetes*), and puffballs (*Gasteromycetes*). The relation of the *Basidiomycetes* to the other groups of fungi is problematical.

SACCHAROMYCETES. The group *Saccharomycetes* (yeasts) is a very problematical one. The fact that the spores of many fungi pass into yeast conditions when placed in the proper nutrient solutions, suggests the derivation of this interesting group from one of several sources. In a sense the yeasts are degenerate forms, for they have adopted a simple life history and morphology, but physiologically they are highly differentiated.

BIOLOGIC PRINCIPLES ILLUSTRATED BY FUNGI. Some general biological principles are admirably illustrated by the fungi. Probably no other of the lower plants are so varied in their adaptation to special life conditions as are the fungi. The fact is shown by the immense number of species, for the fungi are far more numerous than the algae, and they present more varied methods of asexual reproduction than does any other group of plants. Besides the specialized spores for rapid distribution, there are devices by which the protoplasm of the fungus may at any time pass into a resting state, and so survive unfavorable conditions. When the entire plant body is affected, the resting condition is called a sclerotium, and if small portions are so specialized they are called chlamydospores. As would be expected, the development of a large number and variety of reproductive conditions makes possible very complicated life histories (polymorphism), and in this respect the fungi are the most remarkable of all plants. This astonishing development of polymorphism, with its varied and specialized reproductive phases, is directly traceable to the parasitic or the sapro-

phytic life which a fungus must always lead. The evolutionary influences work constantly toward the special and successful adaptation of the parasite to the host in the one case, or of the saprophyte to its particular nutrient substances in the other. The result of fungal evolution is necessarily immense diversity, shown not only by the number of species, but also by the wonderful variety of things that fungi can do. Species of *Bacillus* among the Bacteria have a general similarity of form and structure, but some are mere saprophytes, concerned only with some phase of decomposition, and others are parasites in the higher animals, even man, and are the cause of subtle diseases. It is important to note that the life of fungi has led to the degeneration of sexual organs, and finally to their entire suppression. Yet some of the groups in which sexuality is entirely lost are the most successful in establishing themselves, as is exemplified by the toadstools and rusts.

In conclusion, the conception of the fungi should be an immense assemblage of parasites and saprophytes with several points of origin from different stocks of the algae, and branching out into innumerable species, each adjusting itself to the peculiarities of a life leading to constant specialization. There can be, in evolution of this character, no general structural results, such as are exhibited, for example, by sexual evolution and by the differentiation of the sexual (gametophyte) and sexless (sporophyte) generations among the algae by the increasing importance of the sexless generation through the mosses and ferns, and by heterospory and the reduction of the sexual generation (gametophyte) in certain fern-plants and in all the seed-plants.

For general treatment of the fungi, consult: Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887); De Bary, *Comparative Morphology and Biology of the Fungi, Mycetozoa, and Bacteria*, translated by Garnsey (London, 1887); Zopf, *Die Pilze* (Breslau, 1890); von Tavel, *Vergleichende Morphologie der Pilze* (Jena, 1892). Some special works are listed in the articles on the various groups of fungi.

FOSSIL FUNGI. Although fossil remains of fungi are sufficiently common to indicate that these plants were important members of the floras of all periods from the Carboniferous to recent time, comparatively little has been done toward studying them, and the sum total of our knowledge of fossil fungi is small. There seems to be no great difference between the ancient and the modern forms. The earliest known fossil fungi have been described as Peronosporites from the Silurian system. They occur as mycelial threads with frequent bulbous expansions in limestones of the Clinton series in western New York, and were detected in thin sections of the rock that were being studied under the microscope. The Carboniferous fungi consist largely also of mycelia, referred to the same genus Peronosporites, the threads and bulbs of which have been found in the stems of *Lepidodendrons* from the British coal measures. Similar forms have been found in fossil fruits (carpoliths) from the coal measures of France.

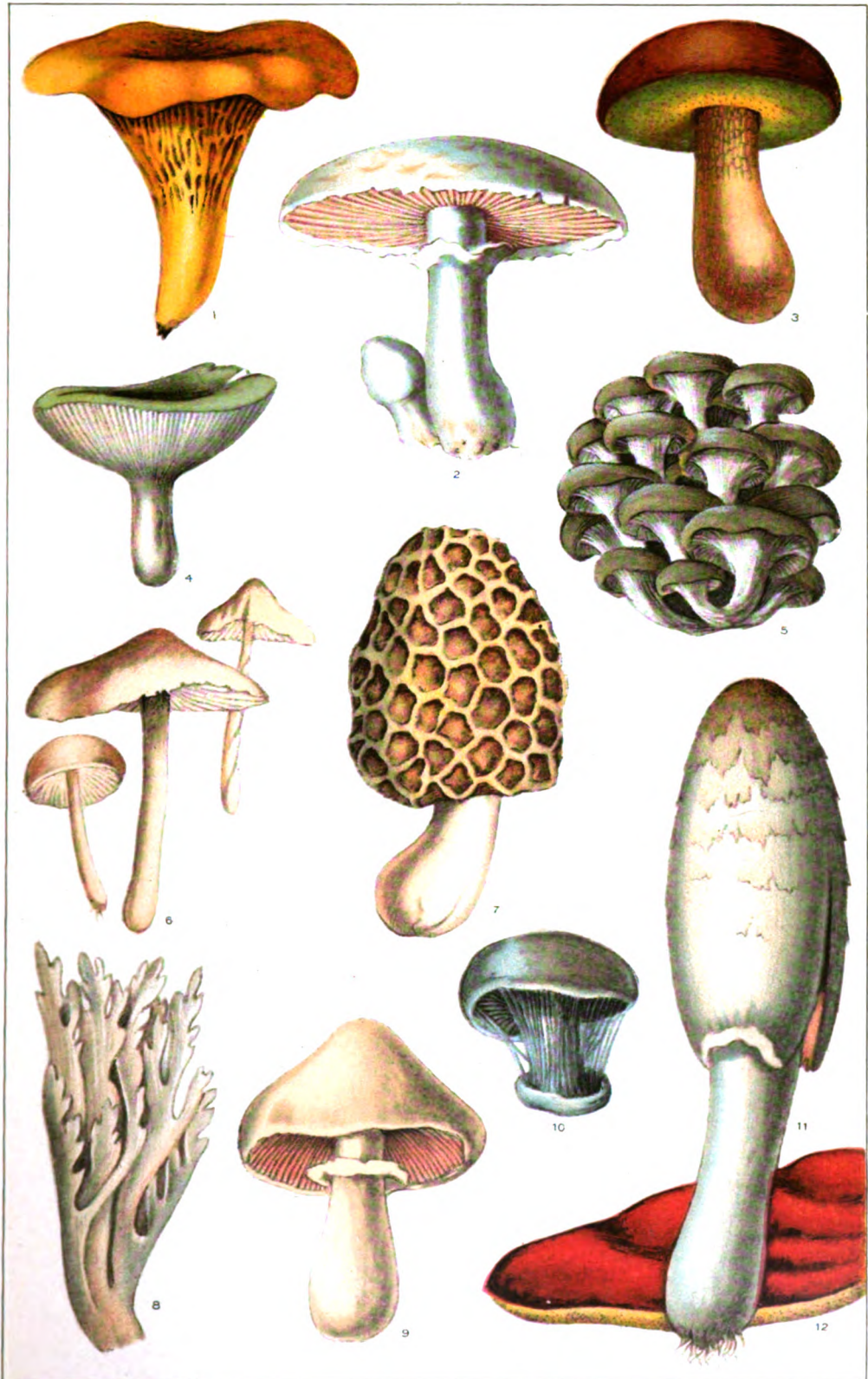
The Tertiary deposits have afforded many fossil fungi. The silicified woods of Egypt, Europe, and North America contain many species.

Fossil leaves from the Tertiary shales and sandstones often bear patches of the parasitic Ascomycetes, which are very difficult to study in the fossil state. The leaves in amber also carry Ascomycetes, and amber insects infested with mucorine fungi have been found. Toadstools, and other members of the Hymenomycetes, are rarely represented in rocks of Tertiary and post-Tertiary age. They appear in the Tertiary lignites of Europe and North America, with the genera *Hydnum*, *Lenzites*, and *Polyporus*. Interesting, though indirect, evidence that toadstools and similar forms were far more abundant during the Tertiary times than is indicated by their meagre fossil representatives, is afforded by the fact that large numbers of fossil beetles and flies found in the rocks of that period belong to genera which at the present time are wholly fungus-eaters.

Consult: Zittel, Schimper, and Barrois, *Traité de paléontologie*, part ii.; *Paleophytologie* (Paris, Munich, Leipzig, 1891); Solms-Laubach, *Fossil Botany* (Oxford, 1891); Loomis, "Siluric Fungi from Western New York," in *Bulletin of the New York State Museum*, No. 39 (Albany, 1900).

FUNGI, ECONOMIC. Species of fungi that may directly or indirectly affect man's welfare. Of those that affect man directly, the edible and poisonous species and some parasites, such as ringworm, barber's itch, etc., may be mentioned as examples (see FUNGI, EDIBLE AND POISONOUS; MUSHROOM; TRUFFLE); of those that affect him indirectly are plant diseases, molds, some animal diseases, etc., whose functional activity may result in monetary or some other kind of loss. A large majority of fungi (saprophytes) are capable of living only on decaying organic matter, and since they do not ordinarily attack living plants, they do not produce plant diseases. They are therefore of little economic importance except as they occur on fruits and other food-stuffs, timber, clothing, etc., when they may be considered harmful. On the other hand, many of these organisms are more or less beneficial, since they act as scavengers in the destruction of organic matter which would long cumber the earth if dependent upon the slow process of chemical oxidation. Under abnormal conditions of moisture, temperature, etc., some saprophytic fungi (usually called facultative parasites) are able to attack and injure living plants. The parasitic species (another large group) occur normally upon living plants and animals, from which they derive their sustenance. The plant or animal upon which they live is called the host. The relationship between host and parasite is more or less intimate, and as the economic plants are affected, the importance of the parasite is the greater. In some cases the fungi are of positive benefit to man because they (entomogenous fungi) destroy noxious insects, as locusts, grasshoppers, flies, scale-insects, etc.; others live at the expense of fungi that are themselves injurious to plants of value to man, as in the case of *Darlucella*, a parasite of the injurious asparagus rust. The number of fungi that attack living animals is large, and in some cases the attack is very destructive. Young fish in hatcheries are subject to diseases due to fungi; and higher animals often suffer similar attacks. A lung disease of horses is caused by the presence of the fungus *Botriomyces*, and the

EDIBLE FUNGI



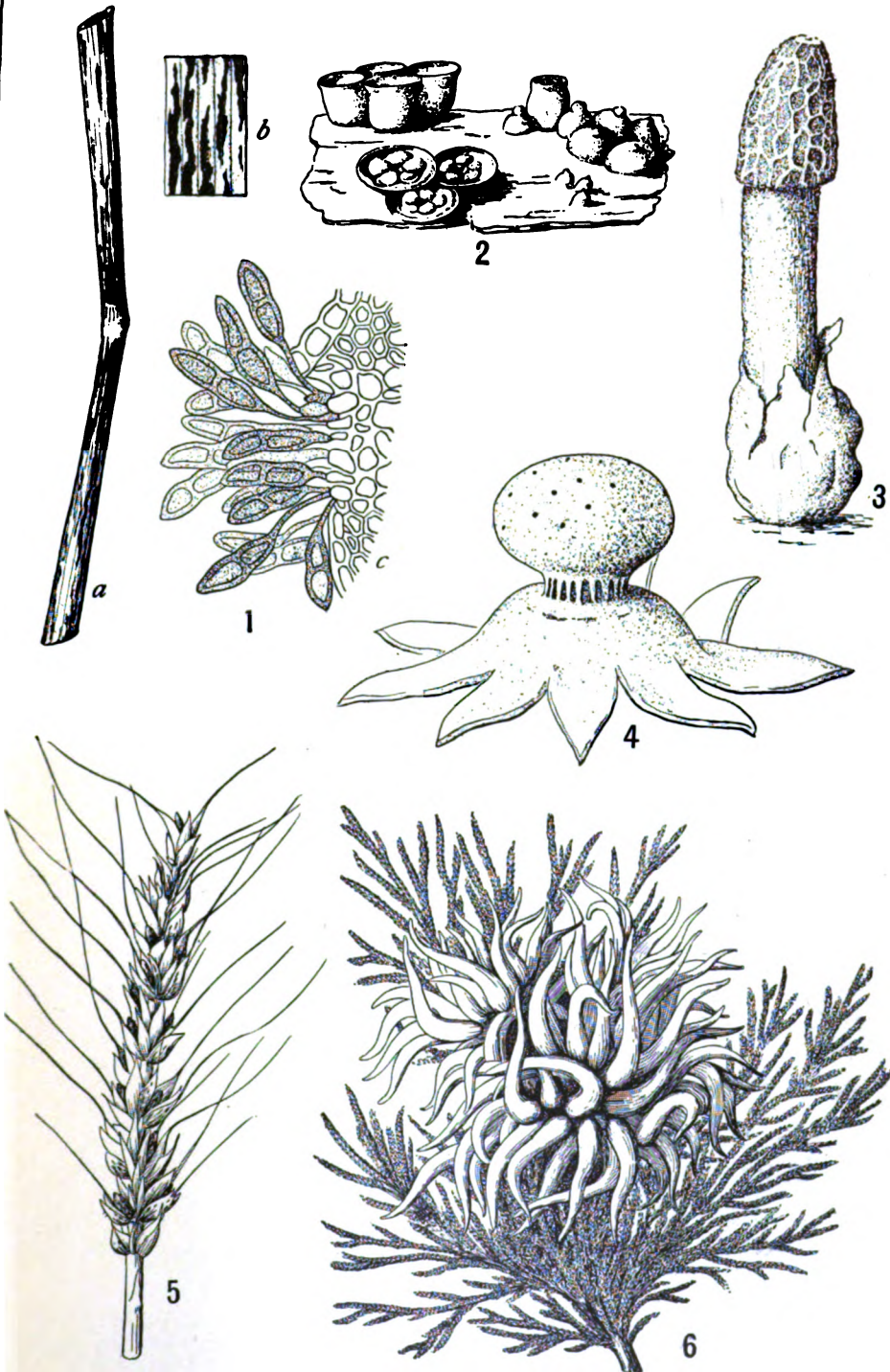
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JULIUS BIEN & CO. LITH. N.Y.

- 1 CHANTERELLE - CANTHARELLUS CIBARIUS
- 2 COMMON FIELD MUSHROOM - AGARICUS CAMPESTRIS
- 3 EDIBLE PORE MUSHROOM - BOLETUS EDULIS
- 4 VARIABLE MUSHROOM - RUSSULA HETEROPHYLLA
- 5 OYSTER MUSHROOM - AGARICUS OSTREATUS

- 7 MOREL - MORCHELLA ESCULENTA
- 8 CLAVARIA CINEREA
- 9 HORSE-MUSHROOM - AGARICUS ARVENSIS
- 10 CORTINARIUS COERULESCENS
- 11 HORSE-TAIL FUNGUS - COPRINUS COMATUS

TYPES OF FUNGI



1. WHEAT RUST, Showing (a) breaking out on a stem; (b), portion of stem enlarged; and (c), group of Teleutospores.

2. NEST FUNGUS.

3. STINKHORN.

4. EARTH STAR.

5. WHEAT SMUT.

6. CEDAR APPLE.

various forms of ringworms, favus, barber's itch, etc., are all due to fungi.

When mention is made of fungous diseases the term commonly refers to diseases of plants caused by attacks of parasitic fungi. The number of species of such parasitic fungi is very large, and nearly every garden, orchard, and greenhouse crop may be attacked by one or many. The various parts of the maize-plant are subject to the attack of at least seventy species of fungi; the common tulip-tree, or yellow poplar, is reported as the host of nearly one hundred species; the oat-plant has a dozen such enemies, and so on. The annual loss attributed to the attacks of fungi, to which the reduced yield and inferior quality of the product are largely due, amounts to hundreds of millions of dollars. It has been estimated that the average loss due to oat-smut in the United States alone amounts to more than \$18,000,000 annually. If to this sum be added the similar losses of other great economic crops, the total would be enormous. Cereal rusts in the United States are believed to cause more loss than any other source of injury, and often the loss amounts to more than the damage done by all other enemies, fungous and insect, added together. In certain localities the grape crops have been almost wholly destroyed by parasitic fungi, and certain truck crops have suffered similarly. The great famine in Ireland during 1846-47 has been largely attributed to the almost total destruction of the potato crop, through the attack of the potato rot (*Phytophthora infestans*).

The general classification of the fungi, aside from the Myxomycetes and the Bacteria, some of which are of great economic importance, is divided into four main groups: (1) The Phycmycetes, which include the water-molds destructive to young fish; the well-known fly-fungus, by which flies are often fixed to window-panes, particularly in the autumn; the black mold of food-stuffs, manure heaps, etc.; the downy mildews, as the potato rot, peronospora of grape, etc. (2) The Ascomycetes, or sac-fungi, which include the powdery mildews of grape, gooseberry, cherry; the blue molds, the black knot of plums, ergot of rye, peach leaf-curl, the black wart-like growths on many trees; the cup fungi, so called from the shape of their fruiting organs, etc. (3) The Æcidiumycetes, which include the rusts and smuts of various plants. (4) The Basidiomycetes, which embrace the mushrooms, toadstools, coral fungi, shelf fungi, etc. From an economic standpoint the parasitic species of the second and third groups are of the greatest importance. Fortunately, many of the diseases caused by these parasites may be prevented by the adoption of certain precautionary measures, by the application of a fungicide (q.v.), and by the exercise of proper methods of cultivation by which the general vigor of the plant is improved. See DISEASES OF PLANTS; also diseases of specific crops: e.g. APPLE; GRAPE; POTATO; WHEAT; MAIZE, etc.

FUNGI, EDIBLE AND POISONOUS. A general name given to mushrooms, toadstools, puffballs, etc., that may or may not be eaten with safety by man.

EDIBLE FUNGI. More than 700 species have been found to be safe, and many are considered very nutritious. (See MUSHROOM.) Perhaps

the principal reason that fungi are not more generally eaten is not so much that their value is unknown, as that people are afraid even to touch the plants because certain species are known to produce illness and even death. In the interests of safety, therefore, every writer upon the subject of edible and poisonous fungi iterates the warning to avoid eating any fungus the edible qualities of which are not positively known to the would-be consumer beyond the slightest shadow of doubt. Since certain toadstools (especially *Amanita phalloides* and *Amanita muscaria*, described below) are mistaken by the uninitiated for the common mushroom, all fungi found in the woods or in shady places (until they are proved to be wholesome) and all that have white or yellow gills should be avoided: the common mushroom grows in the open fields, and has pink gills which gradually turn to purplish-brown or black. A safe plan for the novice to adopt, even on becoming familiar with the twelve edible species described and illustrated, after being satisfied with their identification, is to eat only a small portion of a fungus new to him, to note the results carefully, and to allow several hours to elapse before indulging more freely. In no case should he be guided by pleasant taste alone, because some of the species considered unwholesome do not manifest any disagreeable quality.

(1) *Chanterelle (Cantharellus cibarius)*, common in light woods and on high ground, grows from two to four inches tall, expands from two to three inches, and has an irregular lobed orange or yellow cap, which when young is dome-like, but with age becomes expanded, and depressed at the centre. The gills are thick, short, branching, and wide apart. The stem, at first white and solid, later becomes hollow. Since this species is rather tough and dry, only crisp heavy specimens should be selected for the table. A closely related poisonous species, *Cantharellus aurantiacus*, found in rank or decaying grass, closely resembles the above in color, but has thin, crowded gills of deeper tint than the cap. (2) The common field mushroom (*Agaricus campestris*), which grows from two to four inches tall, is probably the commonest, best known, and most easily distinguished of all. It is the only one that is cultivated to any extent. (See MUSHROOM.) The cap is fleshy, from one and one-quarter to four inches broad, usually white, but sometimes tawny or brownish above, and when in prime condition, pink below. With age, it changes to dark brown. Upon the stem is a collar, the remains of a veil, which in the young mushroom joins the margin of the cap to the stem. This mushroom has never been found growing in woods or shady places, but always in open pastures, fields, and lawns. (3) The edible pore mushroom (*Boletus edulis*), found most abundantly during the autumn in pine, oak, and chestnut woods, has a brown white-fleshed cap from four to six inches across, with convex tubes at first white, but changing to yellow and then greenish. When in the pale-yellow stage the plants are most tender and edible. The two to six inch stem becomes light brown, with a network of pinkish veins near the top. (4) The variable mushroom (*Russula heterophylla*), a common species found in woods from July to November, is usually some shade of dingy green, never

reddish or purple. The stem is white, solid, and firm; the gills, white, narrow, crowded, forked. The fleshy cap when peeled is white, of firm texture, and mild, sweet, nutty flavor while young and fresh; wilted and old specimens are not desirable even when free from grubs, which are specially fond of the plant. (5) Oyster mushroom (*Agaricus ostreatus*), common on moist, decaying tree-trunks throughout the United States. The cap is shell-shaped, three to five inches broad, dark when young, soon bleaching to brownish, and later yellow; stem white, short, or wanting, thickened upward; gills broad, rather distant, white or sometimes yellowish. Flesh tender, except in old specimens, of pleasant, but not pronounced, flavor. Especially good when dipped in egg, and fried slowly like an oyster. (6) The fairy-ring (*Marasmius oreades*) grows in short grass of lawns, pastures, etc., but never in woods. Its common name is derived from its habit of growing in ring-like patches, which increase in diameter as the plants reach outward to new feeding ground. The mushrooms are small (one to two inches broad, and two to three inches tall), reddish at first, pale afterwards, solid, very tough, with broad, distant, free gills, alternately long and short. They have a weak but agreeable odor, and mild, sweet, and nutty taste, which is retained well when the mushrooms are dried by exposure to air or sun—the simplest way to preserve them. It is one of the best and the most easily digested. The hairy-foot (*Marasmius personatus*) which grows in woods on dead leaves, etc., must not be mistaken for the fairy-ring, since it is unwholesome. This species has darker and narrower gills, and a hairy down at the base of the stem. (7) Morel (*Morchella esculenta*), common in spring in old apple orchards and in woods, especially under butternut trees and on burned-over surfaces or places where wood ashes have been scattered. The pale yellow, buff, or tawny cap is attached to the stout whitish hollow or stuffed stem by its base, is ribbed and pitted like honeycomb. The morel is one of the most easily recognized and the choicest species of edible fungi. Its near relatives (genus *Morchella*), which more or less closely resemble it, are all edible. (8) *Clavaria cinerea*, a fungus without a cap, which may be found in the woods from June until frost, grows from one to three inches high, in tufts or colonies, and has thin or thick stems lighter than the numerous irregular, wrinkled gray branches. It is considered the best of the *Clavarias*, but is said to be injurious in large quantities and to be digested with difficulty by weak stomachs. (9) Horse-mushroom (*Agaricus arvensis*) is considered by some writers to be a variety of the common mushroom, which grows in similar places, but is slightly larger (two to five inches tall, three to five inches or more broad), has gills which turn from whitish to pink, and then dark brown, and a stem which is either hollow or stuffed with floccose pith. By some it is considered inferior and by others superior to the common mushroom. (10) *Cortinarius caruleus*, an almost odorless species found among moss in woods, has a convex or plane yellowish cap two to three inches across, slightly rounded, thin, closely crowded, blue or purplish gills, which change to a dull cinnamon with age; and firm violet, pale or whitish stems about two inches long, which rise from bulbs more than an inch thick. (11) Horse-tail fungus (*Copri-*

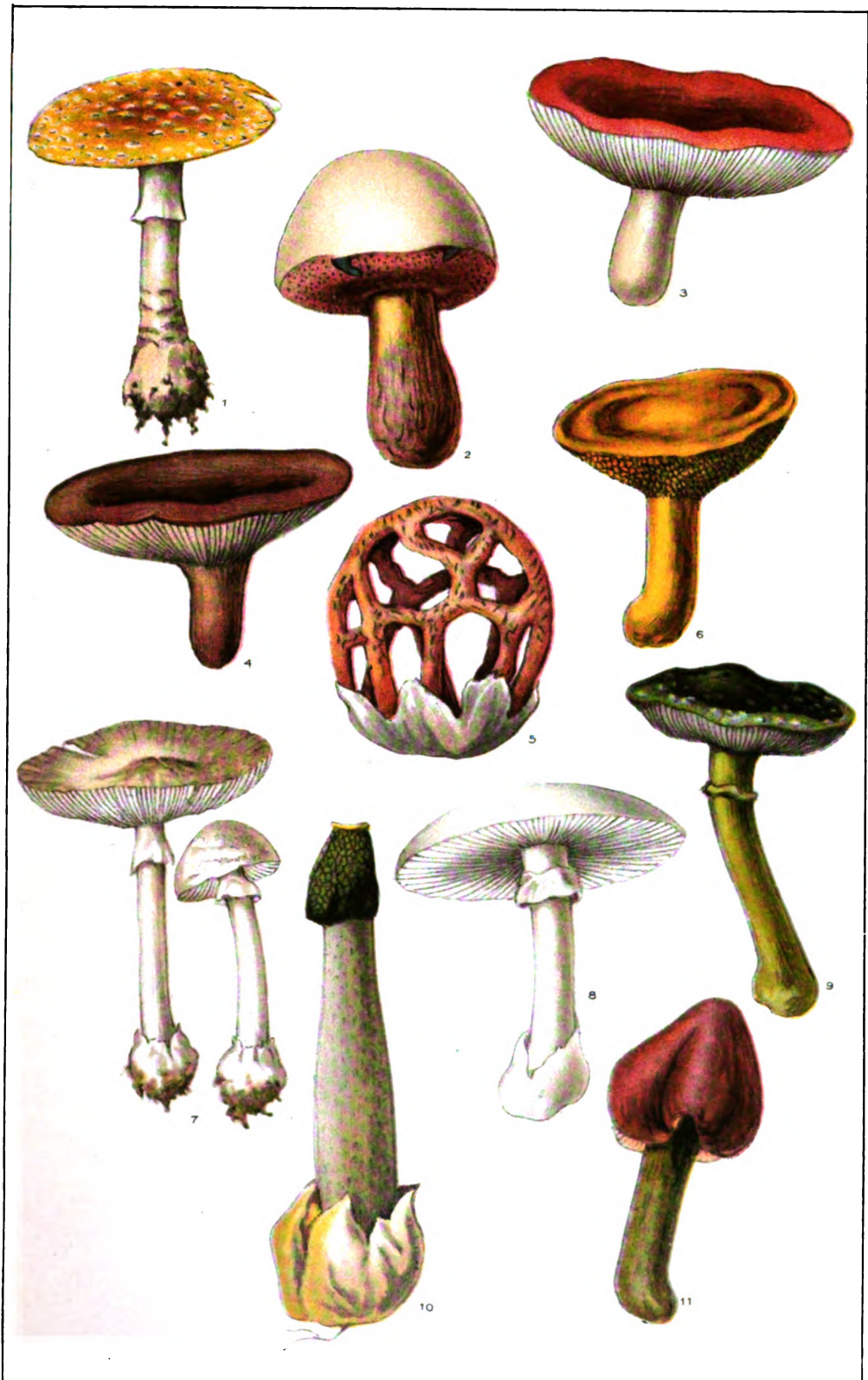
nus comatus) may be found after hard rains from August until frost, sometimes in spring, singly or in clusters, in a great variety of places, from rich soil to dumping-grounds. The cap is fleshy, at first oblong and white, but later a ragged bell-shape, and purplish black; the gills are crowded, broad, free from the stem, at first white, then pink, after which the plant becomes unfit for food, since it turns from purple to black, and dissolves into ink-like drops. The stem is hollow, often ten inches long, but mostly hidden under the cap. It is not of high flavor, but is of great delicacy when young. (12) Liver-fungus (*Fistulina hepatica*) is a juicy red, fibrous-fleshed, non-rooting fungus, which may be found upon decaying trees and stumps, especially on oak, beech, and chestnut, after rains in summer and autumn. Under the name of beefsteak fungus it is highly esteemed everywhere for its rich nutritious flesh of acid flavor and agreeable odor.

POISONOUS FUNGI. The number of fungi formerly considered poisonous was very large; investigation, however, has proved that many so regarded are not merely innocuous, but are good for food. The results are that not a few old beliefs have been upset, and others are made to totter. Poisonous fungi may be divided into two groups: those that contain local irritant poisons, which quickly act on the alimentary tract; and those that contain poisons which, after the lapse of several hours, act on the nerve-centres. Members of the first group, though exceedingly disagreeable in their effects, produce no serious disturbance, and unless eaten in very large quantities or by persons in ill health, need not be considered dangerous. The administration of an emetic, followed after action by doses of sweet oil and whisky, or sweet oil and vinegar, is recommended. Unfortunately, members of the second group give no warning of their harmfulness either by an unpleasant taste or by local action on the digestive tract, and toxic quantities of the poison are usually absorbed before symptoms appear. Should a poisonous *Amanita* be eaten by mistake or through carelessness, "take an emetic at once, and send for a physician, with instructions to bring hypodermic syringe and atropine sulphate. The dose is $\frac{1}{10}$ of a grain, and doses should be continued heroically until the $\frac{1}{2}$ of a grain is administered, or until, in the physician's opinion, a proper quantity has been injected. Where the patient is critically ill, $\frac{1}{4}$ of a grain may be administered." The treatment is effective only when the first symptoms manifest themselves, and not when late effects of the dangerous toadstool poisons are evident.

The species illustrated and described herewith have, until recently, been considered poisonous, but some of them are either merely innocuous, injurious to only certain individuals in the same way that strawberries are, or are even more generally wholesome. Every one, even the fungi expert, should consider himself a novice until he has personally determined these two points.

(1) Fly amanita or fly mushroom (*Amanita muscaria*), common in woods, especially of pine and birch, has a cap four or more inches broad, which, in its varieties, exhibits many colors—blood-red, bay-brown, orange, lemon, white, and the tint of cooked liver. Usually the skin, which

POISONOUS FUNGI



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- 1 FLY MUSHROOM - AMANITA MUSCARIA
- 2 SATAN'S MUSHROOM - BOLETUS SATANUS
- 3 EMETIC MUSHROOM - RUSSULA EMETICA
- 4 RUDDY-MILK MUSHROOM - LACTARIUS RUFUS
- 5 TRELLISED CLATHRUS - CLATHRUS CANCELLATUS

- 6 FIERY BOLETUS - BOLETUS PIPERATUS
- 7 DEADLY AGARIC - AMANITA PHALLOIDES
- 8 SPRING MUSHROOM - AGARICUS (AMANITA) VERNUS
- 9 VERDIGRIS MUSHROOM - AGARICUS AERUGINOSUS
- 10 FETID WOOD-WITCH - PHALLUS IMPUDICUS

is at first thick (sticky in damp weather), checks more or less and peels in angular fragments. The flesh is yellow just beneath the skin, otherwise white and rather loose. The stem, which is white, scaly, long, stout, but soon hollow, is bulbous at the base, and bears a very soft torn frill or ring close to or even at its summit. The gills are white, sometimes yellow. This species is everywhere reported as poisonous, but is said to be eaten by the Siberians to produce a sort of intoxication. Its name, *muscaria*, is derived from its property of killing flies. (2) Satan's mushroom (*Boletus satanas*) is a somewhat rare species which grows in woods. Its cap, three to eight inches across, is usually brownish, yellow, or whitish, and rather sticky; tubes yellow, with bright red mouths, which later become orange; stem two or three inches long, thick and reticulated above. Its flesh, which is whitish, turning to reddish or bluish where injured, is mild, reputed poisonous, but eaten without discomfort by many. Since its evil effects seem to vary with the individual who partakes, it should either be avoided or tested with extreme care. (3) The emetic mushroom (*Russula emetica*) has a cap three to four inches broad, rosy, changing to blood-red, then tawny; sometimes yellow at first and later white. Its shape changes from bell-form to flat, or with a depressed centre, and a furrowed tubular margin. The gills are white, rather free, broad, and distant. Reputed to be emetic and poisonous, but eaten with impunity by many. (4) Ruddy-milk mushroom (*Lactarius rufus*) is a rare species which grows in damp woods and swamps. Its cap is two to four inches broad, at first convex, later concave, usually shining brownish-red; gills narrow, sometimes forked, yellowish or reddish; stem, two to four inches long, lighter than the cap; flesh, pinkish, extremely acrid, reputed very poisonous. (5) Trelliced clathrus (*Clathrus cancellatus*), a reputed poisonous fungus of beautiful red, white, or yellowish lattice-like form, and of very offensive odor. The latticed part rises from a white or fawn-colored cup. (6) Fiery Boletus (*Boletus piperatus*), a common but variable species in woods and open places, is one to three inches in diameter, yellowish, light-brown, or reddish, convex or almost flat, on a stem one and one-half to three inches tall, reddish or bright yellow at its base. The flesh, white or yellowish, loses its acrid peppery flavor when cooked. Though reputed poisonous, this species has been eaten with enjoyment by many. (7) Deadly agaric, deadly amanita, death-cup (*Amanita phalloides*), a common and very variable species found in woods from June until frost, is one of the most poisonous of mushrooms. The cap is three to four inches across, shining white, lemon, grayish-brown, blackish-brown, or grayish-brown with a black disk sometimes dotted, viscid in damp weather; stem, three to five inches long, sometimes much longer, white and rather smooth, hollow above, larger, solid, and bulb-like below, rising from a sort of cup—hence the name 'death-cup'; and bearing near its summit a reflexed, swollen, white, usually entire ring; gills white, free. This species is perhaps most dangerous, because most often mistaken for the common mushroom (*Agaricus campestris*). Since it grows in the woods, has white gills, white spores, and a cup-like base, the collector is to blame if he

makes any mistake: the common mushroom does not grow in the woods, has pink gills, dark spores, and no cup at its base. (8) Spring mushroom (*Agaricus* or *Amanita vernus*), considered to be a variety of the preceding, which grows in similar places, but during spring and summer. (9) The verdigris mushroom (*Agaricus aeruginosus*), common from July to November in woods and meadows, has a cap about three inches in diameter, covered with a green or blue slime; a long, scaly, hollow, bluish stem, and brown or purplish gills. It is reputed poisonous, probably because of its disagreeable odor, color, and taste. (10) The fetid wood-witch (*Phallus impudicus*) grows during summer and autumn in woods, fence-corners, kitchen yards, and under wooden steps. Its cap expands but little, is about two inches from edge to summit, and is borne in a thick (1¼-inch) stem, six to eight inches tall, which rises from a white or pinkish cup two inches in diameter. This toadstool cannot be mistaken when full grown, because of its exceedingly offensive odor, which attracts blow-flies and carrion-beetles. The young plants are said to be very good when fried, but when mature the odor is against this species, and it is then considered unwholesome. (11) Red-juice mushroom (*Hygrophorus conicus*), found in woods and open places from August to October, has a thin, fragile, acutely or obtusely conical yellow, bright red, or scarlet cap one-half to one inch across, with a lobed margin; rather close, broad, yellow, free gills; and a hollow yellow stem, three to six inches long. Formerly this species was considered poisonous, probably on account of its color; it is now proved not to be merely harmless, but good for food.

Consult: Melville, *One Thousand American Fungi* (Indianapolis, 1900); Coville, *Observations on Recent Cases of Mushroom Poisoning in the District of Columbia*, Circular 13, Division of Botany, United States Department of Agriculture (Washington, revised ed. 1897); Farlow, *Some Edible and Poisonous Fungi*, Bulletin 15, Division Vegetable Physiology and Pathology, United States Department of Agriculture (Washington, 1898); Marshall, *The Mushroom Book* (New York, 1900); Taylor, *Student's Handbook of Mushrooms in America* (Washington, 1897-98); Atkinson, *Studies and Illustrations of Mushrooms*, Bulletin 138, Cornell University Agricultural Experiment Station (Ithaca, 1897); Gibson, *Our Edible Toadstools and Mushrooms* (New York, 1895); Peck, *Mushrooms and Their Use* (Cambridge, Mass., 1897); id., "Report State Botanist on Edible Fungi of New York." *Annual Report New York State Museum*, vol. iii., No. 4 (Albany, 1900).

FUNGIBLES. In the civil law, articles of personal property, such as food, fuel, etc., loaned to another for the purpose of being consumed: that is, such objects as cannot be used without being given away or consumed, which were the subjects of the civil law contract of *mutuum*. Objects of this nature, from the fact that they were got rid of one for another (*fungantur*), were called fungibles. See *MUTUUM*.

FUNGICIDE, fūn'jī-sīd (from Lat. *fungus*, mushroom + *cædere*, to kill). Any material that will destroy fungi or prevent the germination of their spores. Fortunately for agriculture, there are a number of substances which may be

employed for this purpose. On account of their destructive influence, copper salts, which form the basis of many fungicides, are used in several of the most important. A few of the commonest and best fungicides are given herewith. When used upon foliage, the liquids must all be applied as a mist-like spray, especially to the under sides of the leaves, where many of the fungi gain entrance through the stomata, and only in sufficient quantity to moisten the surfaces, without standing on them or running off in drops. Neither should they trickle off dormant wood.

Bordeaux mixture, accidentally discovered in France about 1882, is the best general fungicide known. It consists of a solution of copper sulphate and lime. The corrosive action of the former upon many kinds of foliage is neutralized by the lime, which also makes the mixture more adhesive. The following is considered the best method of preparation: In a wooden vessel dissolve copper sulphate at the rate of one pound to a gallon of water by suspending the salt in a coarse bag just below the surface of the water. It will dissolve more quickly if suspended than if placed at the bottom. In another vessel slake stone lime with just enough water to cover it. This lime should contain little or no magnesium. When slaked, add water until the proportion is one pound of lime to one gallon of water. When needed for use, these two stock-solutions, as they are called, are diluted with water, and then mixed with as much agitation or stirring as possible. The proportions in the final mixture should be six pounds of copper sulphate, four pounds of lime, fifty gallons of water for applying to dormant wood and strong foliage, such as apples and currants; for young and for tender foliage, such as peach and plum, an extra pound of lime and twenty-five gallons more of water should be added. To test the neutrality of the mixture, a drop of ferrocyanide of potassium is added to a little of the compound, and if a brown color is observed, more lime must be added; if none, then the fungicide may be applied with safety. The stock-solution of copper sulphate may be kept indefinitely; the lime for only a few days. Since the mixture deteriorates rapidly by the flocculation of lime particles, it should be mixed fresh for each application.

Ammoniacal copper carbonate solution is almost as good as Bordeaux mixture, and since it is clear, and therefore produces no stain, it is better than Bordeaux mixture for spraying on ornamentals and ripening fruits. It is made by dissolving one ounce of copper carbonate in one pint of ammonia, and adding ten gallons of water.

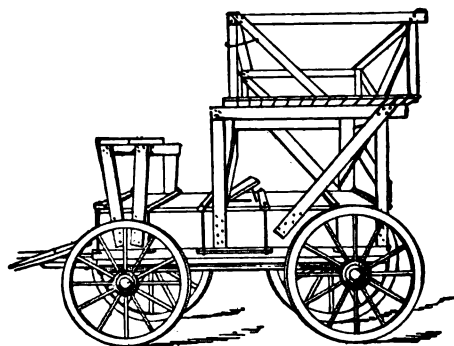
Eau celeste is an important fungicide, but in inexperienced hands it may burn the foliage of many plants. It is made by dissolving one pound of copper sulphate in two gallons of water, adding one and a half pints of ammonia when cooled, and diluting with water to twenty-five gallons.

Copper sulphate dissolved in water at the rate of one pound to ten gallons of water is of great value as a spray for fungi, lichens, algae, etc., upon dormant trees and vines. It should not be used on foliage because of its corrosive action. The seed of oats, wheat, barley, etc., may be soaked in this solution to destroy the spores of smut (q.v.).

Sulphur has an important rank among fungicides, especially as a remedy for powdery mildews. In outdoor use it is dusted upon the foliage, but in greenhouses it is generally evaporated. Either the steam-pipes are coated with it, or it is more rapidly volatilized by heating it in a sand bath over an oil stove. Extreme care must be exercised to prevent ignition, since the fumes of burning sulphur are fatal to plants, as may be seen from their use in ridding greenhouses of plant growths and spores upon the soil, benches, walks, etc. Of course, when so used, the houses are emptied of useful plants.

Hot water may be applied when nearly boiling to kill certain fungi and insects without injuring the plants. Its more valuable use, however, is for the destruction of smuts of cereals. For this purpose, also, solutions of formalin and of corrosive sublimate may be successfully employed. The methods of using these fungicides will be described more fully in the article on SMUTS.

METHODS OF APPLICATION. The apparatus needed to obtain the mist-like spray referred to above are nozzles, hose, and a force-pump. The nozzles are the most important part of the machine. Those of the 'Vermorel' type are con-



A FORM OF SPRAY-CART.

sidered the most satisfactory for short range, and the McGowan for long. Most progressive orchardists use the former upon the ends of long bamboo tubes, the operators often being raised upon platforms as shown in the figure. A common form of apparatus is the so-called 'knapsack' pump, a tank which is strapped over the shoulders like a knapsack. It contains a very compact and powerful pump, and is convenient for small plots and for crops that have grown too large to permit the entrance of a wagon sprayer. Success in combating plant diseases depends upon the thoroughness with which the fungicides are applied. No fixed rules can be given as to times for spraying, but in general three or four applications should be given at intervals of ten days or two weeks. If much rainy weather intervene, one or two additional sprayings may be profitably given. In spraying fruit-trees and vines of all kinds, the first application should be given just as the buds begin to swell, but before they show characteristic color. No spraying should be given when the plants are in blossom, but one should follow the fall of the petals. Plant diseases are worse during some seasons than during others; hot, moist weather favors the rapid growth of many fungi. Perennial

plants should be sprayed every season to keep them in good condition; the increased yields of better crops will more than pay for the trouble and expense of spraying. Spraying is preventive, not remedial.

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FUNGOID PARASITE. A name occasionally used for fungi which are parasitic upon plants or animals. See FUNGI, ECONOMIC.

FUNGUS. A term applied in pathology, with several different meanings. Almost any growth from the skin or mucous membranes which has a cauliflower-like or excrecent character may be referred to as a fungoid growth. The term fungus is also used in connection with certain vegetable parasites which incite disease. These may be divided into three groups: (1) Bacteria or fission fungi (*Schizomycetes*); (2) yeast-fungi (*Blastomycetes*); and (3) mold-fungi (*Hyphomycetes*). Bacteria and their relation to disease will be found fully described under BACTERIA and DISEASE, GERM THEORY OF; also found under their respective titles. Yeasts occur in the stomach in some forms of indigestion, and have been found in the bladder in diabetes. A few cases of skin diseases have been reported in which the yeast-fungus was apparently the exciting agent. The most common molds which are met with in pathology are (1) the *Trychophyton tonsurans*, which is the active agent in the disease known as *tinea sycosis* or ringworm (q.v.); (2) the *Achorion Schoenleinii*, which is the parasite of favus (q.v.); and (3) the *Microporon furfur*, which is the cause of pityriasis versicolor, a skin disease.

FUNGUS-BEETLE, or FIDDLE. An extraordinary carabid beetle (*Mormolyce phyllodes*) of Java and the neighboring mainland, very variable



FUNGUS-BEETLE.

in size, but sometimes three inches long, yet so flat as to be able to creep into surprisingly thin crevices. It is brown, with black legs and antennæ, and the elytra are thin, soft, translucent, and greatly expanded, giving it a very strange form. These beetles remain in dark places, under bark, etc., during the day, and are particularly fond of hiding behind the fungi growing on trees. Within these their eggs are laid, and the larvæ make their home, feeding, it is believed, on the larvæ of other insects. This insect is known to the English residents about Penang as the fiddle-beetle, in allusion to the outline of its body.

FUNGUS-GNAT. One of the little flies of the family Mycetophilidæ, so called from the fact that many of them breed in fungi, including edible mushrooms. They are as a rule delicate and rather slender, with clear wings, but sometimes the wings are smoky or have large dark spots. The larvæ are slender, cylindrical maggots, more or less worm-like in appearance. The damage which they do in mushroom-beds is sometimes very great, and it becomes necessary at certain seasons of the year to cover the growing mushrooms with gauze.

FUNJ, fūnj, or FUNG. A mixed Hamite-Negro people on the Upper Nile. They have not the woolly hair nor the flat nose of the negro, and the color varies much as that of the mulattoes in the United States. Their language also betrays their Abyssinian origin. The Shilluks and Dinkas are of the same stock. The Kingdom of Sennar was founded by them in the seventeenth century and lasted until overthrown by Mehemet Ali, in 1821. See Bruce, *Travels* (Edinburgh, 1805).

FUNK, fōŭk, FRANZ XAVIER VON (1840—). A Catholic theologian. He was born at Abts-Gmünd, Württemberg, and was educated at Tübingen, at the Seminary of Rottenburg, and in Paris, where he devoted himself chiefly to the study of political economy. In 1870 he was appointed professor of theology at Tübingen. His principal publications are: *Opera Patrum Apostolicorum* (2d ed. 1901); *Lehrbuch der Kirchengeschichte* (3d ed. 1898); *Kirchengeschichtliche Abhandlungen und Untersuchungen* (1897-99).

FUNK, HEINRICH (1807-77). A German landscape painter, born at Herford, Westphalia, pupil of Schirmer at the Düsseldorf Academy. In 1836 he settled at Frankfurt, and from 1854 to 1876 was professor at the Royal School of Art in Stuttgart. He was gifted with keen observation, a fine sense of beauty of form and line, and his pictures are notable for perfect drawing, minute execution, and poetic conception, often combined with splendid light effects. Among those in public galleries are: "Castle Ruin in the Gloaming" (1834), National Gallery, Berlin; "Lower Inn Valley" (1846), and "Ruin by the Lake" (1852), Stadel Institute, Frankfurt; "The Kaisergebirge in the Inn Valley," and "Stormy Weather in the Eifel," Stuttgart Museum. He also left more than five hundred charcoal and pencil drawings of sterling quality.

FUNK, ISAAC KAUFFMAN (1839—). An American clergyman, editor, and publisher. He was born at Clifton, Ohio, and was educated at Wittenberg College, in his native State. After being pastor of Saint Matthews English Lutheran Church, in Brooklyn, N. Y., for seven years, he made an extensive tour through Europe, Northern Africa, and Asia Minor (1872). Among the numerous religious publications founded by him after 1876 are the following: *Metropolitan Pulpit* (now the *Homiletic Review*), the *Voice*, a well-known prohibition paper, and the *Missionary Review*. In 1889 the *Literary Digest* was established, and in 1895 the *Standard Dictionary* was published. One of the more recent projects undertaken by Dr. Funk is the *Jewish Encyclopedia*, a repository of the history and traditions of the Jewish people from the earliest times to the present day, the first volume of which appeared in 1901.

FUNK, PETER. A name used of persons employed at auctions to offer bogus bids in order to raise the price.

FUNNY BONE. A term used to designate really not a bone, but the ulnar nerve, which is so slightly protected in the groove where it passes behind the internal condyle of the humerus (q.v.) that it is often affected by blows on that part. (See ARM.) A peculiar electric thrill passes along the arm to the fingers whenever the nerve is struck or pressed.

FUNSTON, FREDERICK (1865—). An American soldier, born at New Carlisle, Clark County, Ohio. He studied for two years at the Kansas State University (Lawrence, Kan.); was a member of the reportorial staff of the *Kansas City Journal*; became connected with the United States Department of Agriculture, in 1891; accompanied the Death Valley expedition to southern California as assistant botanist; and in 1893-94 was in Alaska, where he made for the Department a collection of the local flora and obtained material for the field-report included in F. V. Coville's *Botany of Yakutat Bay* (Washington, 1895). In 1896 he was appointed deputy comptroller of the Atchison, Topeka and Santa Fé Railway; during the same year offered his services to the Cuban Junta; and later was commissioned captain of artillery, and distinguished himself as such at La Machuca. He was promoted successively to be major and lieutenant-colonel (for bravery at Las Tunas); endeavored, by reason of wounds and illness, to escape to the United States; was captured by the Spanish, and, although condemned to death, was finally set free. At the outbreak of the Spanish-American War he organized the Twentieth Kansas Volunteers, a force very similar to the well-known 'Rough Riders,' and became its colonel. From November, 1898, he served in the Philippine Islands, where, for bravery at Calumpit, he was appointed brigadier-general of volunteers in 1899. Owing to illness, he was relieved in 1899, and returned to the United States. He later returned to the Philippines, and on March 23, 1901, succeeded in capturing Emilio Aguinaldo, the insurgent leader, thus dealing an effective blow at serious native resistance. On March 30 he was commissioned brigadier-general, U. S. A. Consult the article by Scott in the *Independent*, vol. liii. (New York, 1901).

FUR AND THE FUR TRADE. (OF. *forre*, *fuerre*, It. *fodero*, case, sheath, from Goth. *fōdr*, AS. *fōdder*, OHG. *fuotar*, Ger. *Futter*, sheath). Many species of animals, especially those living in cold climates, have a soft, silky covering called fur, which in some animals is mixed with a covering entirely different in texture, long and straight, called the over-hair. It is often this over-hair which gives the distinctive peculiarity and beauty to the fur. The use of the skins of beasts with the fur still on them, as clothing, is of very ancient origin. The Chinese and Japanese used furs as articles of luxury at least 2500 years ago. Herodotus mentions their use by other ancient peoples. By the Romans furs were much prized, especially during the later days of the Empire. The Saracens also made great use of them, and from them the Crusaders brought them into general favor in Europe, where so much extravagance was exhibited in their use that in both France and England sumptuary edicts were

issued against this fashion. But such laws, like most regulations of the sort, had little effect, and the demand for furs continued among all classes of people. It was to meet this demand that those pioneer explorers, the trappers and traders, penetrated the northern forests of America, and established little trading stations which proved the vanguards of civilization. Albany and Saint Louis, and many other flourishing American cities, are the outgrowth of these stations. In the early days the most valuable furs could be obtained from the Indians in exchange for glass beads or other trifles. At one time this trade was carried on, especially in Canada, by *coureurs des bois*; but the scandalous practices of these reckless rangers brought the trade into such disrepute that a licensing system was established.

Beaver-skins were used in New Amsterdam and elsewhere in place of gold and silver for currency, and the figure of a beaver is a conspicuous device on the escutcheon of the city of New York. The search for furs was one of the objects of the daring expeditions of the voyagers of French Canada, as the search for gold was the motive of the Spanish invasion of Mexico and South America. The famous Hudson Bay Company originated in 1670, and claimed the entire country from the Bay to the Pacific, and from the Great Lakes to the Arctic Ocean, except such portions as were then occupied by Frenchmen and Russians. Toward the close of the eighteenth century, certain Canadian merchants formed the Northwest Fur Company, having their headquarters at Montreal, their operations being carried on in the districts watered by rivers that flow to the Pacific. This organization soon became a formidable competitor to the Hudson Bay Company. In 1821 the two companies united. In 1763 some merchants of New Orleans established a fur-trading post where Saint Louis now stands, under the management of the brothers Chouteau. For the first half of the nineteenth century the Saint Louis trade was from \$200,000 to \$300,000 a year. One of the most famous of early American fur-traders was John Jacob Astor, of New York, who began by trading in a small way after his arrival in the country in 1784. By 1810-12 his trade, conducted under the name of the American Fur Company, was enormous. An entirely new field for American enterprise was opened by the purchase of Alaska in 1867, which secured complete control of an important seal-fishery. This field was so eagerly worked that it was found necessary to limit the taking of seals to the bachelor males, lest the animals should be altogether exterminated.

Collectors and dealers in Canada and the United States forward their furs to the seaboard, chiefly to New York, for sale there, or for consignment principally to London and Leipzig. Of the fur marts, London is the chief; for thither tends, by the laws of trade, not only much of the produce of Asia and Europe, but also the fine peltries of Chile and Peru, the nutria from Buenos Ayres, the fur-seal of Cape Horn and South Shetland, the hair-seal from Newfoundland, as well as the inferior peltries of Africa. To prepare fur skins in a way to endure this long transportation is a simple and easy matter. When stripped from the animal the flesh and fat are carefully removed, and the pelts hung

in a cool place to dry and harden; nothing is added to protect them. Care is taken that they do not heat after packing, and that they are occasionally beaten to destroy worms. A marked exception is the case of the fur-seal, which is best preserved by liberal salting and packing in hogheads. All other raw furs are marketed in bales.

Few kinds of animals furnish a pelt of suitable weight and pliability, and all of them differ widely in elegance of texture, delicacy of shade, and fineness of over-hair; and these differences determine their place in the catalogue of merchandise. These few animals are not very prolific, and many of them attain their greatest beauty in wild and uncultivated regions, although there are some notable exceptions. Being thus few in kind, and limited in quantity, the extinction of the several choice varieties has been threatened through the persistent energy of trappers.

The principal North American fur-bearing animals are beaver, muskrat, hare, and squirrel; the mink, sable, fisher, ermine, weasel, raccoon, badger, and skunk; the lynx, northern and southern; bears of several kinds; foxes of three or four varieties; two wolves; and most valuable of all, musk-ox, seal, and sea-otter. Of foreign fur-bearing animals the most highly prized are the chinchilla, coypu (nutria), and various monkeys, marsupials (opossum, kangaroo, etc.), and cats. (See articles under their names; also, FUR-BEARING ANIMALS.) Many of the animals, however, enumerated in the American list are also natives of Northern Europe, whence their pelts come to market under other names.

For manufacturing purposes, furs are classified into *felted* and *dressed*. Felted furs, such as beaver, nutria, hare, and rabbit, are used for hats and other felted fabrics, in which the hairs or filaments are made so to interlace or entangle as to form a very strong and close plexus. The quality of the fur is better when the skin is taken from the animal in winter than in any other season, giving rise to the distinction between 'seasoned' and 'unseasoned' skins. The removal of the fur from the pelt is a necessary preliminary to the preparation of fur for felting purposes. The long hairs are cut off by a kind of shears; and the true fur is then removed by the action of a knife, requiring much care in its management. In some sorts of skin the long hairs are removed by pulling instead of shearing; in others, the greasiness of the pelt renders necessary a cleansing process, with the aid of soap and boiling water, before the shearing can be conducted; and in others, both pelt and fur are so full of grease as to require many repetitions of cleansing. For beaver-skins a machine of special construction is employed in cutting the fur from the pelt.

Furs have their felting property sometimes increased by the process of *carroting*, in which the action of heat is combined with that of sulphuric acid. The chief employment of felted furs is described under HAT, section *Manufacture*. See also FELT.

Dressed furs are those to which the art of the *furrier* is applied for making muffs, boas, and fur trimmings for garments. The fur is not separated from the pelt for these purposes; the two are used together; and the pelt is converted

into a kind of leather to fit it for being so employed.

The process of dressing furs, while in its general outlines the same, differs in its details with the character of the fur. The fur of the seal is prepared as follows: The salt used in packing is first thoroughly washed out, and every particle of flesh is carefully removed from the inside of the hide, after which the skins are stretched on frames and slowly dried. The process of thorough washing, this time in soapsuds, is repeated, and while the skin is still moist the long over-hair is removed with a knife, leaving only the short soft fur. This process is a delicate and tedious one. The skin side of the pelts, after being subjected to moist heat, is shaved down until a smooth, even surface is obtained. When the skin is again dry it is placed in a tub filled with fine hardwood sawdust, which absorbs any moisture remaining, and is softened and rendered flexible by treading with the bare feet. It is now ready to be dyed. The coloring matter is applied with a brush to the tips of the fur and distributed by shaking the fur. It is then dried and brushed. The process of dyeing, drying, and brushing is often repeated as many as twelve times.

FUR-BEARING ANIMALS. The group of animals whose pelts are utilized as fur garments or ornaments, forming the carnivorous family Mustelidæ. This family, which includes, besides its typical weasels (Mustelinæ), the skunks (Mephitinæ), the badgers (Melinæ), the otters (Lutrinæ), and the sea-otters (Enhydrinæ), the honey-badgers, ratels, etc., is world-wide in its spread outside of Australia. It is in the Northern Hemisphere, however, that the family is now most numerous and well represented; and it is in response to the demand of the cold winters of the subarctic regions, to which the most valuable of these animals are confined, that their coats have become the warm felts which mankind finds so serviceable and attractive. All are small animals, the largest (the wolverine) being only about three feet long. Their bodies are in most cases slender, their legs rather short, their heads round, with very powerful jaws and teeth, and their tails (except in the skunks) are rather short. Great strength, nimbleness, and courage characterize them, and many exhibit a blood-thirst beyond that of any other carnivore; nevertheless, they have been tamed. Weasels have always acted as mousers in the East, and were so used in ancient Greco-Roman civilization. Ferrets still serve as vermin-catchers, and otters have been taught to fish, while badgers were formerly used in cruel sport. Most of them are terrestrial and live in burrows of their own digging, but some are arboreal. They feed upon small mammals, birds, birds' eggs, fish, crustaceans, and insects; and all possess, in a greater or less degree, anal glands, from which they can discharge at will (sometimes shooting it a long distance) an acrid fluid, which is intensely offensive to the nostrils and mucous membrane of other animals. The chase of the leading members of this family has long been and still is an important industry on the frontiers of Europe and North America, and thousands of pelts have been gathered annually without exterminating any of the race, though the habitats of many species have been much reduced. Statistics of the trade in furs in London show that during the last

century the receipts of pelts there of Mustelidæ alone, from North America exclusively, amounted to about 3,250,000 sables, 1,500,000 otters, 100,000 wolverines, 3,000,000 minks, 25,000 sea-otters, 500,000 skunks, and 500,000 badgers, besides an unknown number of ermines, fishers, etc. "The scientific interest with which the zoölogist, as simply such, may regard this family of animals, yields to those practical considerations of every-day life which render the history of the Mustelidæ so important." Consult authorities mentioned under MAMMALIA, especially Coues, *Fur-Bearing Animals* (Washington, 1877). See BADGER; ERMINE; FERRET; FISHER; MARTEN; OTTER; POLECAT; SABLE; SEA-OTTER; SKUNK; WEASEL; WOLVERINE; and similar titles.

FÜRBRINGER, fūr'brīng-ēr, MAX KARL (1846—). A German anatomist and writer on comparative morphology. He was born at Wittenberg, and was educated at Jena and Berlin. In 1888 he was appointed to a professorship at Jena. His publications include several valuable works on the anatomical structure and development of the Vertebrata, such as: *Die Knochen und Muskeln der Extremitäten bei den schlangennähnlichen Saurien* (1870); *Zur Entwicklung der Amphibienniere* (1877); and *Untersuchungen zur Morphologie und Systematik der Vögel* (1888).

FURCA ET FLAGEL/LUM (Lat., gallows and whip). In feudal relations, the lowest of servile tenures, in which the bondman was entirely at the lord's mercy, both in life and limb.

FURETIÈRE, fūr'tyār', ANTOINE (1620-88). A noted French philologist, lexicographer, and novelistic satirist. He was born in Paris, was trained for the law and the Church, but afterwards gave his life to letters. He published a volume of verse (1655), and two satires, the *Nouvelle allégorique, ou Histoire des derniers troubles arrivés au royaume d'éloquence* (1658), and *Voyage de Mercure* (1659). These won him an academic seat (1662). Already he had begun the preparation of a dictionary which, as its copyright 'privilege' states, was to contain all French words, old as well as modern. For twelve years he labored on it, when in 1674 a royal decree was issued forbidding any one to publish a dictionary till that of the Academy should appear. He published his own dictionary, notwithstanding, in 1694, ten years before the first dictionary of the Academy was ready. That body behind closed doors condemned him for plagiarism, a slander tardily refuted by the appearance of their own dictionary in 1694. Furetière was expelled from the Academy (1685), and his right to print in France revoked. He resisted with wit and courage in a shower of epigrams, but under the strain and the disappointment, he died in Paris, May 14, 1688, two years before his dictionary appeared at Rotterdam (1690). He was also a realistic novelist. Among his novels is *Le roman bourgeois* (1666). Furetière's dictionary was edited by Basnage in 1701, and again revised in 1725. It furnished the basis for the *Dictionnaire de Trévoux* that at length displaced it. Consult Körting, *Geschichte des französischen Romans*, vol. ii. (2d ed., Oppeln, 1891).

FURFOOZ (fūr'fōz') **RACE**. From brachycephalic skulls found at the Trou de Frontal, Furfooz, Belgium, this type of mankind is sup-

posed to date from the end of the Quaternary period, just at the commencement of the Polished Stone age. The first appearance of broad-headed man in Europe at Furfooz, as well as at Grenelle and Cro-Magnon, associated with longheads, took place at different dates in the Neolithic period. Mortillet places the Furfooz man in the Robenhausean epoch of the Neolithic period, and also says that the associated relics have been disturbed. Consult: *Le Préhistorique* (Paris, 1900); Deniker, *Races of Man* (1900); Sergi, *The Mediterranean Race* (London, 1901).

FURIES. See EUMENIDES.

FURIOSO, fūr-ré-ō'só, BOMBASTES. See BOMBASTES FURIOSO.

FURIOSO, ORLANDO. See ORLANDO FURIOSO.

FURIUS, MARCUS FURIUS BIBACULUS (c.103 B.C.—?). A Latin poet, born at Cremona. He wrote iambics, epigrams, and a poem on Cæsar's Gallic wars. "Jupiter hibernas cana nive conspuet Alpes," the opening line in the poem on Cæsar, is parodied by Horace (Sat. II., 5, 41), who substitutes Furius for Jupiter, and speaks of the poet as *pingui tentus omaso*, "distended with his fat paunch." It is probable that Furius also wrote the poem *Æthiops*, containing an account of the death of Memnon, and that the *turgidus Alpinus* of Horace is really Bibaculus. He is compared by Diomedes with Horace and Catullus, and is enumerated among the Roman iambic poets by Quintilian (X. 1, 96). Consult: Bährens, *Fragmenta Poetarum Romanorum* (Leipzig, 1886); and Weichert, *Dissertatio de Turgido Alpino S. M. F. Bibaculo* (1822).

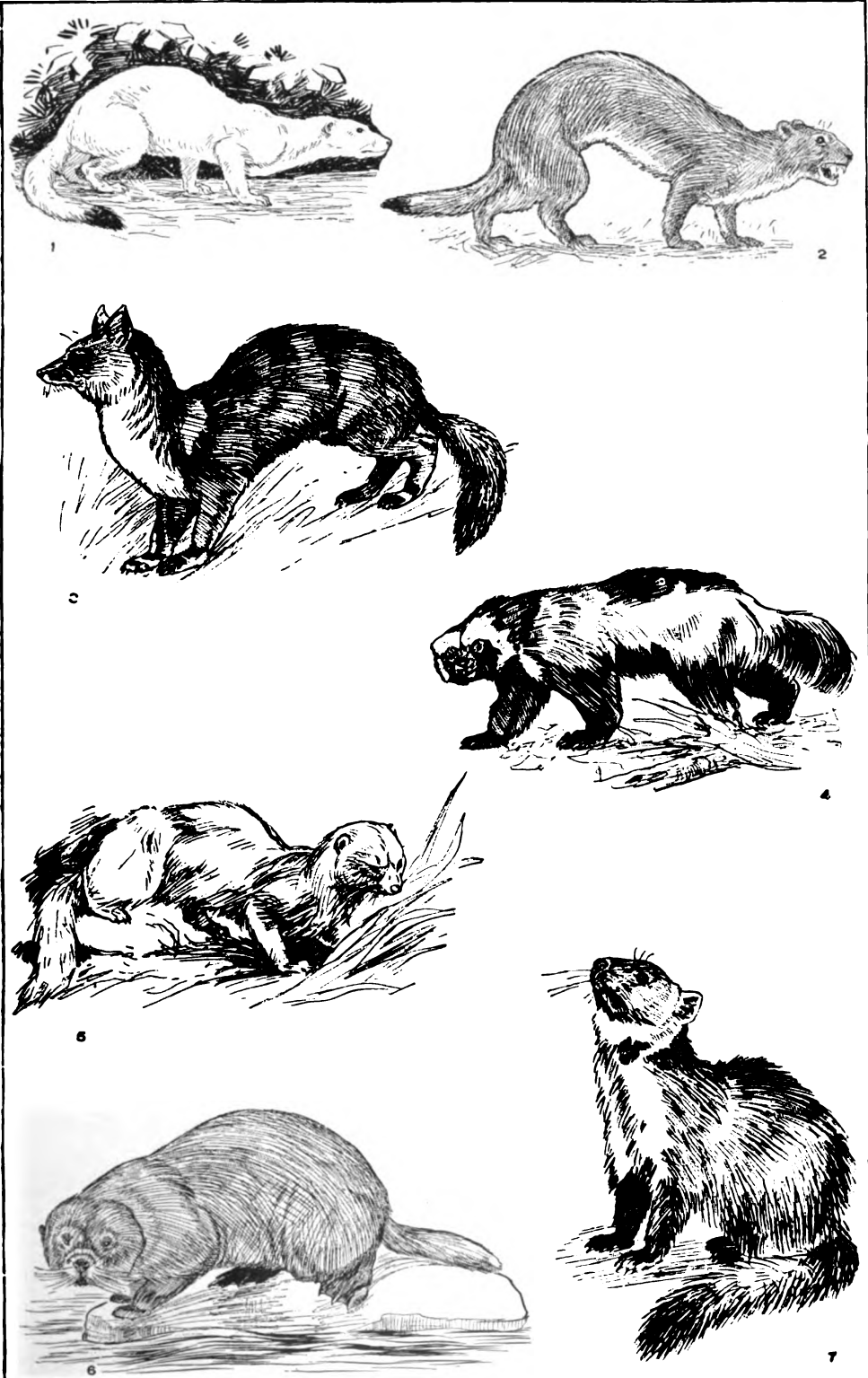
FURLOUGH, fūr'ló (Dutch *verlof*, from Dan. *forlov*, leave, from *for*, Eng. *for* + *-lof*, Dan. *lov*, Ger. *Laube*, Eng. *leave*, permission). A military term, applied to the leave of absence of the rank and file. It does not apply to commissioned officers. In the United States Army furloughs in the prescribed form for periods of 20 days may be granted to enlisted men by commanding officers of posts, or by regimental commanders, if the companies to which they belong are under their control.

The number of men furloughed at any one time is not to exceed five per cent. of the enlisted strength. In England the furlough season is confined to the winter months, generally from the 15th of October to the 15th of March. All soldiers with over twelve months' service, and qualified in conduct and musketry ability are entitled to six weeks' furlough. In France and Continental Europe generally, soldiers in the active army who have qualified in their duties, and can read and write, may, at the end of twelve months' service, be sent on furlough for an indefinite period.

FURMAN, fūr'màn. RICHARD (1755-1825). An American Baptist clergyman, born at Esopus, N. Y. He was pastor of the First Baptist Church of Charleston, S. C., from 1787 until 1822. During this period he was also active as a legislator, and took part in the deliberations on the first Constitution of South Carolina. As one of the foremost promoters of the Baptist movement, he was elected in 1814 first president of the Triennial Convention of Baptists.

FURNACE (from OF. *fornais*, Fr. *fournaise*, It. *fornace*, from Lat. *fornax*, furnace, from *for-*

FUR-BEARING ANIMALS



1. WEASEL (*Mustela erminea*), in white winter or Ermine dress.
2. WEASEL (*Mustela erminea*), in brown summer or Stoat dress.

3. SABLE (*Mustela zibellina*).
4. WOLVERENE OR GLUTTON (*Gulo luscus*).
5. FERRET OR POLECAT (*Mustela putorius*).
6. SEA OTTER (*Lutra lutra*).
7. AMERICAN PINE MARTEN (*Mustela Americana*).

ness, oven; connected with Lat. *formus*, Gk. *θερμός*, *thermos*, Skt. *gharma*, hot, Eng. *warm*). A structure in which to make and maintain a fire, the heat of which is used for heating, generating steam, smelting ores, melting metals and glass, baking pottery, and for a great variety of other purposes in science and the arts. Furnaces may be divided into the following classes: (1) Furnaces in which the fire and the material to be heated are placed in contact. To this class belong the open blacksmith fire (see *FORCE*), blast-furnace, cupola or foundry furnace, etc. (See *FOUNDING* and *IRON AND STEEL* for descriptions of blast-furnaces and converters and foundry furnaces.) (2) Furnaces in which the fuel is in one compartment and the material to be heated in another, the material being heated by the flame and hot gases from the burning fuel. The most familiar form of this class of furnace is the reverberatory, employed in heating and melting iron and steel. (See *IRON AND STEEL*.) (3) Furnaces in which the material to be heated is within a close chamber or retort which is heated externally by the fire or by flame and gases from the fire. Pot furnaces for making glass (see *GLASS*), and crucible furnaces for making crucible steel (see *IRON AND STEEL*) are examples. Furnaces may employ gas, powdered coal, and oil as fuel. The Siemens gas furnace is used in steel manufacture. (See *IRON AND STEEL*.) Furnaces for generating steam and those for heating form in a measure classes in themselves. See *BOILERS*; *FUEL*; *HEATING AND VENTILATION*; *KILNS*.

FURNEAUX, fŭr-nŭ', TOBIAS (1735-81). An English navigator and discoverer, born at Swilly, near Plymouth. In 1766 he accompanied Wallis in the latter's voyage around the world. Three years after his return in 1768, he commanded the *Adventure* in Captain Cook's voyage, but became separated from him, and continued his exploration independently along the coast of Tasmania, naming the principal points on it. A group of the Low Archipelago was subsequently named after him by Cook.

FURNEAUX ISLANDS. An Australasian group lying in latitude 17° S. and in longitude 143° 6' E., between Australia and Tasmania (Map: Australia, H 6). They were discovered in 1773 by Tobias Furneaux.

FURNESS, HORACE HOWARD (1833—). An American Shakespeare scholar, born in Philadelphia. The son of William Henry Furness, a Unitarian clergyman and author, he graduated at Harvard in 1854. After a period in Europe, during which he received from Halle the degree of Ph.D., he returned home, studied law, and was admitted to the bar in 1859. He contributed to Troubat and Haly's *Practice on Ejectment*, etc., and was a member of the Seybert commission to investigate modern spiritualism, but his *Variorum Shakespeare* is his peculiar work. This he began early, and during the next twenty years issued thirteen volumes, as follows: *Romeo and Juliet* (1871); *Macbeth* (1873); *Hamlet* (2 vols., 1877); *Lear* (1880); *Othello* (1886); *Merchant of Venice* (1888); *As You Like It* (1890); *Tempest* (1892); *Midsummer Night's Dream* (1895); *Winter's Tale* (1898); *Much Ado About Nothing* (1899); and *Twelfth Night* (1891). Associated with him in his work was his wife, herself author of a *Concordance to Shakespeare's poems*, and his son, Horace How-

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ard Furness, Jr. Everywhere the Variorum edition has been received as a monument of scholarship, and the adoption, since 1886, of the text of the First Folio as the basis of the work, will by many be thought a distinct gain. Dr. Furness's services to learning were recognized by Columbia and Harvard in the respective bestowments of Litt.D. and of LL.D.

FURNESS, WILLIAM HENRY (1802-96). A Unitarian clergyman. He was born in Boston, graduated from Harvard, studied theology at Cambridge, and was minister of the First Unitarian Church of Philadelphia from 1825 to 1875. He was prominent in the anti-slavery movement. His writings include: *Remarks on the Four Gospels* (1838); *History of Jesus* (1850); *The Unconscious Truth of the Four Gospels* (1868); *The Power of Spirit Manifested in Jesus of Nazareth* (1877); *The Story of the Resurrection Told Once More* (1895).

FURNESS, WILLIAM HENRY, JR. (1828-67). An American artist. He was born in Philadelphia, early became interested in art, and studied in various cities of Europe. He commenced his career as portrait painter in Philadelphia, but soon afterwards removed to Boston, where he met with great success. Among his sitters were Charles Sumner, Lucretia Mott, and many other celebrities of the day. His portraits are exceptional for good drawing and color, and their expression of characteristic traits.

FURNESS, WILLIAM HENRY, 3D (1866—). An American ethnologist, born at Wallingford, Delaware County, Pa. He was educated at Saint Paul's School, Concord, N. H., at Harvard, where he graduated in 1888, and at the medical school of the University of Pennsylvania (1891). For scientific purposes he traveled much in South America, and writes interestingly of his researches there and elsewhere, in such books as *Folklore in Borneo* (1899); *Life in the Luchu Islands* (1899); and *Home Life of the Borneo Head-Hunters, Its Festivals, and Folk-Lore* (1902). In recognition of this and similar work, he was made a fellow of the Royal Geographical Society and a member of other scientific associations.

FURNI ISLANDS, fŭr-nĕ (Lat. *Corassia* or *Corseæ*). A group of small islands in the Grecian Archipelago, in about latitude 37° 35' N., and longitude 26° 30' E., between Nikaria and Samos; the largest of them is Furni.

FURNISS, HARRY (1854—). An English caricature artist. He was born at Wexford, Ireland, in 1854, of English parents. He began to figure as an illustrator at a very early age. At the age of 19 he went to London, contributed for many years to the *Illustrated London News*, and in 1880 began to draw for *Punch*. Four years later he joined the *Punch* staff, and his "Parliamentary Views" in that journal became especially popular. He withdrew from *Punch* in 1894, started the *New Budget* in 1895, and visited the United States in 1896-97. He is thoroughly English in sentiment, and depicts middle-class English life with a fine sense of humor.

FURNITURE. Properly, that which furnishes, of whatever nature it may be; and in this sense we speak of house furniture, table furniture, church furniture; and until very modern times

the term included the fixed woodwork of a house or the like. Much the more general application of the term is, since the middle of the nineteenth century, to the articles constructed of wood intended for the use of persons occupying a house, and this with but an infrequent extension to articles of crockery, or metal, or of textile fabric. Thus, in speaking of the furniture of a bedroom, the mirror, the articles of pottery or porcelain upon the washstand, the bed curtains and coverings may indeed be included in the general phrase bedroom furniture, but in saying that one is about to purchase bedroom furniture the idea would be generally that of the bedstead, the bureau, tables, chairs, and the like. It is in this limited and modern sense that the term is used in this article.

The uses of furniture are chiefly these: Seats, because to many races of men it is found expedient to rest the body, that is, the trunk, upon a surface raised from ten to eighteen inches above the floor upon which the feet are supported; tables, which, being raised to a reasonable height above the floor (28 to 36 inches), are convenient alike to one sitting or standing, and may be used for permanent or temporary deposit of articles and for the food and the dishes which contain it at mealtime; simple receptacles, as chests, and, for very small articles, caskets, coffers, and the like; receptacles of more complex character and intended for the frequent deposit and frequent removal of the contents, as cabinets (a general term covering pieces of furniture of various forms), and chests of drawers under the different foreign names adopted into the language, as bureau, chiffonnier, commode; and also wardrobes, for hanging or with shelves for the deposit of folded garments. These last named, in either form, are often confused with cupboards, and are called by names introduced from the French, as *armoire*; structures of shelving for the deposit of books and objects of art and curiosity, which structures may be either open or closed, and are covered by such names as bookcase, whatnot, and by foreign terms, such as *étagère*; and finally, conveniences for writing, combined with some moderate storage of stationery and books which, if they are classed by themselves, are not only tables, or chests of drawers, or sets of shelves, but are often a combination of all three, and are known by such names as writing-desk, writing-table; secretary, davenport, and by foreign names, such as *escritoire* and *secrétaire*.

In Asia generally there is no such general use of raised seats as has become a matter of course to Europeans. They are known, but are rather places of honor. They are not necessarily 'thrones' in the technical sense, because indeed the great throne of Persia and many chairs of state among the peoples of Northern India are large and square and cushioned, and are intended for cross-legged sitting; but those articles that most resemble European chairs are, at all events, the 'seats of the mighty.' In general the people of India sit on rugs and hard, flat cushions like small mattresses. Places for sleeping are, on the other hand, very commonly raised from the floor, and bedsteads of some sort are in use throughout the Peninsula of India by all natives who are not of the very poorest class. This may be accounted for perhaps by the great number of poisonous serpents which in India more than elsewhere in

the world are allowed to coexist even with the somewhat dense population. The furniture of the modern inhabitants of the Levant, such as the city dwellers of Cairo, Damascus, and Basra, consists primarily of a raised platform, called a *deewan* (divan). This is essentially a somewhat soft body, like a mattress, covered with a carpet or rugs, upon which it is agreeable to sit cross-legged or to recline or lie down, the head, shoulders, or the whole body being partly supported by cushions of different sizes and shapes. This *deewan* may be raised to the height of sixteen inches or so, either by a solid structure or by light woodwork. As a general thing it is, whatever its height or size, set upon a raised part of the floor. Although this mattress is movable, and is frequently moved for purposes of cleaning the floor and walls beneath and behind it, it is not adjustable, and cannot be shifted about to different parts of the room, as can a sofa or chair. In some large rooms the raised floor is made so large that the *deewan* may be carried along three sides of it. Thus, in a plate given by Lane (*The Modern Egyptians*) of an interior in Cairo, the raised part of the floor is perhaps six inches above the rest, and upon this there is laid a mattress only about four feet wide and extending across the end of the room and along both sides for the whole length of the raised platform. Upon this mattress cushions are ranged along the wall, but all these are movable, and can be used in any way, one or two at a time to support the arm or the back of the sitting person, or the head of one who would lie down.

Of other furniture in a Levantine house there are chiefly fixed shelves along the walls, upon which are set the more decorative objects of utility, as vases and bowls, and small and low tables entirely movable, with no permanent place in the room, but carried about as the persons seated on the *deewan* have occasion to eat, to smoke, or to play at some game. There is occasionally a sort of cabinet, usually open, affording merely two or three shelves for the temporary deposit of a water-bottle or the like. The need of further furniture is removed by the use of cupboards in the wall, of which there are a great number of different sizes and fitted with shelves of different depth and of different heights between the shelves. The absence of any distinction between dining-room, sitting-room, and reception-room destroys entirely our notions of the proper furnishing of each kind of room.

In a Japanese home simplicity of furnishing is carried still further than in the Moslem East. Closets in the walls fitted with shelves of different sizes in length, width, and height between shelves, and usually closed by sliding doors, are used for clothing, and also for the storage of considerable quantities of as yet uncut pieces. The space under an ordinary staircase may be occupied by shelves and drawers; shelves along the walls are used for lanterns, which are taken out at night, and for hats and the like; lengths of bamboo prettily combined serve for towel-racks and to suspend out-of-door garments; and a curious structure, composed of a vertical strip, which may be either a stiff board or a piece of textile fabric, carries a number of vases, cups, or round boxes of wood or bamboo, arranged in vertical series, into which receptacles many utensils may be thrust for safe keeping, and when made

more decorative may serve for fresh flowers. The simplicity and obvious cheapness of all these things is very remarkable. Almost no attempt is made, even in the palaces of the old daimios, or in such parts of the Imperial palace as have not been altered in very recent times, to give to the interior that costly and luxurious air which Europeans think essential to their own dignity, or which they consider inseparable from beauty of design and perfect taste. To the Japanese, the most refined of decorative artists, simplicity is thought to be the most attractive effect, except for a given piece, upon which the full resources of art are to be lavished. In a room used for the reception of visitors there will be no wall decoration at all, because the walls are either occupied with cupboards or the like, or are opened up into recesses, of which something is said below, or are represented by sliding screens of paper strained on light wooden frames. These paper screens may indeed be richly painted with flowers and birds, or, in many cases, are covered with those colored, flowered, and embossed papers which we in the West purchase under the erroneous name of 'Japanese wall-paper.' This, however, is rare; the decorative papers or the painted surfaces spoken of are used generally for the entirely movable screens in two, three, or four leaves, which are sometimes very low (three feet), as suiting the needs of people who are seated upon the floor, and sometimes of full height (six feet and six inches or even seven feet). It is sometimes asserted that the sliding screens themselves, which form a part of the inclosure of the house, are never decorated, but there is positive evidence that in many cases richly adorned surfaces are applied here as elsewhere.

Of movable furniture, then, there is chiefly the cabinet with drawers and shelves, which is used mainly for the storage of very delicate objects; the writing-table, which may be five, six, or seven inches high, and from a foot to two and a half feet in length and of proportionate width; the boxes which contain paper for writing, which is often very decorative and needs especial care; and the small, light cases which contain a fire-box or fire-pot, and are intended for the use of smokers; the sword-rack, upon which the gentleman of old Japan always laid his sword or swords on entering the house, the use being temporary only, for no sword would be kept there for any length of time; and, finally, very small stands, such as we use to set off vases and other ornamental objects, but which in Japan are used for actual utility, as, for example, to raise a dish with fruit or the like to a convenient height. Of utensils which are not commonly made of wood, except in a few cases, the fire-pot is the most important, and this, which is not unlike the brazero of older Italian usage, may sometimes be a heavy and almost permanent piece of furniture. In all the above list it is noticeable that hardly anything is more than three feet long or more than two feet high. The larger chests of drawers which are occasionally brought here from Japan seem to have been rather traveling conveniences, as they were commonly arranged for transportation on the shoulders of men by means of a long pole passed through rings or slots.

The more elaborate decoration of such a room is confined to one small part of it, a kind of recess, single or double, within which is hung

a picture mounted upon a scroll and unrolled for the occasion, or perhaps two such pictures, and in front of these a vase of flowers upon a rich stand. Even the possessor of a great collection of paintings, of bronzes, porcelains, lacquered boxes, and trays would show in this way but two or three of his possessions at a time. All the rest are kept stored away in the *Kura* or fireproof storehouse, attached to each dwelling of any importance. As for the bed, it consists of quilts, perhaps two or three, laid upon one another, and primarily upon the rice-straw mats which cover the floor. A wooden pillow supports the head—that is to say, the nape of the neck; and these pillows are often topped with a roll of some textile fabric stuffed with straw or perhaps buckwheat hulls, upon which are laid sheets of paper fastened down by strings, and these sheets are pulled off one at a time, so that a clean surface is provided. Even where a mosquito-net is needed it is usually held upon a very light frame, without the slightest attempt at elaboration of any sort, so that even for these transparent curtains there are no bedposts and no testers.

From the moment that one must have a chair or a bench or a couch to sit upon, it becomes natural and in a sense essential to have a raised bed-frame as well, and, moreover, with the chair comes, of course, the high table in all its forms, for eating, for writing, for the playing of games. The Japanese writing-table may weigh a pound, but that of a family using chairs will be thirty inches high, and therefore wide and long in proportion, and may weigh forty pounds even when in the simplest and most utilitarian form; while its size and shape invite elaboration and make it often massive and very costly. Alone among the peoples of Asia the Chinese have used, as far back as our knowledge goes, raised chairs and settles with such results as have been noted in Europe. The Chinese raised seat is indeed usually very high, and either fitted with a footstool or so broad and long that the feet can be drawn up upon it; then this is made of solid and heavy wood, and often the larger surfaces, such as would in Europe be wooden panels, are pieces of marble or other decorative stone inlaid flush with the wooden frame. The use of this material, conducting heat from the body and therefore feeling cold to the touch, points to a custom which is known to exist of covering the whole piece of furniture with such a loose 'slip' as the French call the *houssse*, and it is probable that beneath this *houssse* a thin cushion is sometimes laid upon the seat proper. Tables are made of many sizes; bedsteads are wrought into elaborate designs peculiar to the Chinese, as when the *ciel* or tester is supported, not by vertical posts, but by curved ends, which combine overhead to make an almost circular frame—a cylinder within which is placed the horizontal surface which serves as the bed proper. All this furniture in the more stately interiors is wrought into elaborate carvings invested with that smooth and permanent painting which we call, for want of a better name, lacquer-painting, and with gilding or the imitation of gilding in the same material as the solid color. A throne-like chair will have the horizontals of the back terminating in dragon-heads, each one holding in its mouth a gilded ball, which is loose and yet cannot be withdrawn; the arms and the supports of the seat will be carved in leafage of

brilliant design; the whole will often be excellent in composition, denoting the presence of ancestral types of indefinitely great antiquity. And the reader is reminded that the furniture carved in dark-red wood, of which so much exists in the old families of Canton merchants, is not Chinese except in make—this is not the furniture which the Chinese would make for themselves.

With respect, then, to the high seat and what depends upon it, the furniture of the most ancient nations of Europe and the immediate neighborhood of Europe, such as the Egyptians, seems to have taken the form which has never been, in essentials, abandoned since that time. Painted bas-reliefs and flat wall paintings of all historic epochs except the very earliest are known to us, and they never fail to contain representations of thrones and of chairs, stools and couches which are treated decoratively and shown in such flat projection that their entire structure is sometimes doubtful, but which, when the pieces preserved in European museums are compared with the paintings, may be sufficiently well understood. The use of metal, such as bronze, for such furniture as chairs and couches is peculiar, but such use existed still in the times of the early Roman Empire, as we know from the discoveries at Pompeii, and it need not be supposed that the majority of seats and bedsteads were made in this way—the bronze pieces have been preserved, while the wooden ones have decayed or have been destroyed by the earliest discoveries. There is in the Louvre a piece of wooden furniture composed of four solid uprights inclining inward very slightly, and having at top a box and below a compartment opened by doors in the sides. In other words, this is a small cabinet with two compartments. In the British Museum there are several pieces of furniture made of wood, though none of very great elaboration. The paintings above mentioned leave it generally uncertain whether the pieces represented are of wood or metal. One thing, however, is certain, that Perrot (see *Bibliography*) is correct in his remark that "the interior of the Egyptian house was not empty and bare, like that of a modern Oriental house; there were to be seen everywhere seats with or without arms, tables of varied form, folding seats, stools upon which to put the feet, consoles upon which are placed vases full of flowers, and cabinets for locking up articles of value." That the decoration by carving and color applied to such wooden furniture was rich and varied is known by the singular collection of small wooden objects, such as spoons and ladles and small trays, which are found in great numbers in the museum at Cairo and in the Louvre.

The Greeks, in the earlier historic days, lived a simpler life than the Egyptians. It must have been very rare in the time of Pisistratus of Athens, or at any time before the Persian War, that a household possessed more than one or two raised seats, which seats could be called chairs and were considered as places of honor. There were stools (*klismos*, *threnus*, *klisië*, *diphros*), of which, however, the exact forms cannot be distinguished one from the other. And it is probable that the exact use of each name varied from time to time, and even from town to town. The name *thronos* was applied to a dignified seat probably always furnished with a back and arms. Such a seat was given to each guest to whom

honor was to be done. It appears, then, that the table used for eating was small and low, not necessarily lower than the *thronos* or couch, as shown in ancient bas-reliefs and the like, because in these an effort at perspective or at showing the whole figure of the person seated or reclining may be allowed for, but the table was evidently a movable object, brought on occasion and set beside the chair or couch. One is reminded of the similar custom during the Middle Ages, when, a guest of honor being seated in his armchair with a canopy over his head, a table was brought by the servants and put before him, upon which his meal was served, and which was then removed. A Greek interior was undoubtedly very bare of furniture. On the other hand, the beginnings of disposable wealth and of the taste for luxury are marked by the introduction of such massive and solid pieces as marble seats in courtyards, and in gardens fountains with decorated basins to receive the water, and tables of marble with massive uprights, while at the same time what few pieces of wooden and metallic furniture were placed in the living rooms were more richly adorned. Paintings upon the walls and mosaic floors were more in the way of Greek taste in the matter of decorative interiors than were pieces of movable furniture.

The Roman world under the later Republic and the Empire, recognizing both Oriental and Greek customs, and introducing other conveniences and richer adornments, used seats of many forms, among others bronze throne-like chairs and marble chairs of very rich sculpture for the atrium and the peristyle or inclosed garden. Such seats as these required cushions, and the modern artist of archæological proclivities who represents Greek ladies in their thin and scanty dress, seated upon marble *exedre*, is undoubtedly guilty of an error which is not to be excused by the fact that he finds such things in ancient bas-reliefs. Cushions were used in the amphitheatres to lay upon the stone seats, and so they were by the rowers of galleys. It does not follow that all representations in ancient art are accurate in minute detail, a fact which is well known to those who have tried to restore Greek and Roman costume from the statues and relief sculpture of antiquity.

With both Greek and Roman antiquity we have to keep in mind the much less universal closing of the apartments. It is a matter not perfectly understood how the people of Central Italy could have lived so much in the open air, and the same is true of Greece, where, though there is a warm summer, there is cool weather in the autumn and spring, and in the winter there are cold rains. Something like it is seen in Central Italy of our own time. Interiors so imperfectly closed were not likely to be very much filled with movable furniture. The tendency would be always toward a few massive and costly pieces, and everything else of a slight and temporary character.

Similar traditions seem to have been of weight under the Byzantine emperors, but with this beginning of modern times there is noticeable a great addition to the elaboration of forms applied to seats and other utensils of woodwork. The number of pieces, bedsteads, couches, thrones, or armchairs of different kinds, is constantly increasing throughout the Middle Ages, both in the

Byzantine Empire and in the kingdoms of Western Europe, and this distinction is maintained: that in the East inlaying and painting in brilliant colors is the accepted form of decoration, while in the West at a very early time carving begins to supersede such flat adornment and becomes very soon the one chosen style of decoration. A Byzantine armchair or small square table will be covered with the most delicate zig-zags and simple alternations of rounded and angular forms, inlaid in ivory and in metal upon wood of different colors, or, in cheaper pieces, these simple patterns are reproduced with painting. But this custom, which still held in the countries which are now France, Germany, Spain, and Great Britain until the twelfth century, was even then modified by the use of carving, and in the thirteenth century elaborate sculpture drove it out completely. Then was seen the more curious phenomenon which occurs under the Romans; as the form in sculpture becomes more complicated and takes the eye more perfectly, so that it comes to be thought a nobler thing than color, so painting ceases to be applied to statuary and even to architectural relief. In the same manner in France in the thirteenth century the elaborate sculpture in wood was still touched with gold and color, but with the fourteenth century that seems to have been abandoned and a court cupboard or a chair covered with carving was left in the natural color of the wood, the slightest protection only, by means of oil or the like, being allowed it. The small number of pieces of furniture which even a wealthy family would possess made possible the rich decoration bestowed upon each piece. In a strong castle of the fourteenth century the mistress might have indeed possessed her own large bedroom high in the walls, and with large windows opening on the court, and perhaps a spacious closet, or even a considerable series of closets for storage in immediate connection with it, but in her bedroom she lived, going only to the great hall for one meal in the day, and this rather from a sense of duty as the *châtelaine* than because it was agreeable to her. Her bedroom then would be furnished with a very elaborate carved and perhaps painted and inlaid bedstead, which might be entirely fixed like a bunk in an officer's cabin in modern times, or the closed bedplace of a French peasant down to the middle of the nineteenth century, or might be movable in itself, but having a permanent and heavy tester from which curtains hung around the bed. It would have also a great bench on either side of the fireplace, and perhaps a carved and cushioned throne near the bed, which throne was the consecrated and traditional seat of the lord of the manor, the *seigneur*. Other seats were afforded by stone benches in the deep jambs of the windows and by light and not decorative wooden stools which could be moved about freely. There would be in addition only a table of no great pretensions, because it was continually covered by one or another form of cloth, and at least one cabinet with richly carved doors opening into one, two, or three compartments not very elaborately subdivided. The greater part of the clothing of the family and of the curtains and the like which were not in immediate use were stored away in chests, which might be arranged along the walls of corridors or among the closets of which men-

tion has been made. Only a few and more costly articles would be kept in the cabinet of the bedroom, and with these the two or three manuscript volumes of some importance in leather covers and with clasps, which formed the only accessible books. Writing materials and the necessity of writing materials were unknown to the lords. These were the business of their secretary or scribe or clerk, usually an ecclesiastic, who would carry his inkhorn and tablets about with him. The conditions were altogether favorable for the production of furniture of extreme richness and of great beauty. There was so little of it to make, and that little was so universally a matter of careful thought and preparation, that adornment came as a matter of course.

With the beginning of the Renaissance in art, at the close of the Middle Ages, the constantly increasing tendency toward modern habits caused a great increase in the number of separate pieces of furniture; and with this came at once the disposition toward slighter methods of work and a less careful system of design. It is not to be denied that very magnificent single pieces were made at this time. The single armchair and the small or the larger cabinet would be massive and splendidly carved, with elaborately wrought iron hinges and with extreme beauty of design. Indeed, it is known that such pieces were modeled in clay exactly as a modern sculptor models his group of human figures. The chief object of the designer of such a cabinet as we are considering would be the general dignity of form set off and aided by the carving upon all its surfaces, this carving being appropriate now to the panel and now to the square or rounded upright. Architectural forms were introduced into these cabinets also, and this, though of questionable propriety, has taken such strong hold upon our minds that it amounts to a traditional standard from which we cannot escape altogether. Still in connection with these pieces of exceptional splendor, set off as they were by tapestries and by mural paintings of interest and importance, of religious or of legendary subject, there were multitudes of plain stools and tables, and the like, which were easily made by village carpenters, and of which a few have come down to us. Some trace of this custom is seen in the curious stools still in use in the choirs and sacristies of ancient European churches. These will be absolutely plain in form and an oval hole through the top allows of easy grasping by the hand; they have no carving, no molding, no chamfering, nor are they elaborate in form, but they are painted in some brilliant color, and have, perhaps, the emblem of a saint, perhaps the arms of the bishop upon them. The praying-chair (*prie-dieu*), as a piece of domestic furniture, seems to have been introduced in the fifteenth century. It is a modification of the ordinary church chair, a form which has existed since the Middle Ages, upon the low seat of which one might kneel, and upon the back of which is secured a small shelf to support the service book. There was, however, another form, more resembling a small bookcase with shelves below and a sloping top, and this allowed of considerable sculpture of its panels and frame. Such a praying-desk as this would have no kneeling place; one kneeled upon a footstool or piled cushions.

It is impracticable to follow the changing

forms of the richer furniture during the sixteenth and seventeenth centuries. The marked changes seen in the eighteenth century are chiefly in the increase of the desire for luxurious comfort, that is to say, for low and soft seats with sloping backs, and tables of very diverse forms and of elaboration of outline and construction—all these refinements tending toward that exact fitting of the utensil to the immediate need which we think necessary to-day. In the eighteenth century, however, the ancient traditions of decorative splendor had not lost their power as much as they have to-day, and a person who could afford to have a large and well-made writing-table would not be content with plain wood and machine methods of building and adorning with moldings and the like; he would have fewer pieces and they would be richer. The furniture of Louis XIV.'s time is still made for large and high and somewhat bare palace halls, and is bulky and massive, but here, as early as 1650, the use of veneering and the inlaying of different colored woods, and the use of gilded bronze for metal hinges and lock plates, and even for adornments of the angles and fittings of chests of drawers and tables, shows a marked change from the straightforward woodwork of early times. In this connection we are reminded of the silver furniture with which Versailles seems to have been supplied, in so far, at least, as the royal apartments were concerned, which furniture was sent to the melting-pot during the pecuniary distress of the last years of that long reign. In the next reign, that of Louis XV., silver furniture was used again, and in considerable quantities. In the Paris Exhibition of 1900 the splendid collection of French paintings of the time, made by Frederick the Great, was sent from Sans-souci to the Prussian royal pavilion on the Seine, and with this came, that the setting might be complete, the bronze busts and statues and the solid silver tables which adorned the Potsdam rooms where the pictures were hung. It is probable that none of the original make still exists in France. During the reign of Louis XV. the elaboration of form surpassed anything known to previous times; the legs of tables were carved, the shape of the tops also was no longer square-cornered, but uneven, bounded on every side by curves which flow into one another, the upright sides of chests of drawers and bookcases were also worked into slight but telling curvature, and this tendency toward softened lines was emphasized by the mounting of every part with scrollwork and floral adornment of gilded bronze. The furniture of the time of Louis XV. marks, indeed, the culmination of the easy and luxurious habits of Europe before the French Revolution. There was a sudden change at the close of this reign, and the style named from the succeeding reign, that of Louis Seize, is marked by severe lines, straight and slight tapering legs of tables and the like, and minuteness of decoration, the inlaid patterns and the slight carvings being extremely refined in detail and small in their parts, and the inlay of delicate medallions of porcelain and the like being introduced for the first time, as if mere woodwork were unable to give the high finish and the minute subdivision required.

Contemporaneous with the rich and splendid forms which we call by the names of the last three

kings of the old monarchy there was made in England, and, to a certain extent, in the American colonies, a simpler kind of furniture; at first square and plain in its forms, although elaborately carved over large parts of the surface, but, after about 1720, with forms suggested by the rich decorative work of France. Curved legs, with goats' feet and lions' paws, are given to tables, 'tallboys,' *escri-toires*, and armchairs throughout the eighteenth century, and the forms were not abandoned until the more delicate designs of Sheraton, Heppelwhite, and their contemporaries in London had made familiar to English-speaking people the refinements of the Louis Seize style. This Georgian furniture, often called in America Old Colonial, has the same charm which the contemporary English architecture has—it is not stately, it is not very graceful, but it is felt to correspond with and to fit the small rooms, the quiet domestic interiors for which it was designed. In France, a very dignified style existed in the provinces, carving in low relief in the solid wood replacing the *marqueterie* and the gilded metal mountings of the capital. In Germany there existed during the seventeenth and eighteenth centuries a school of brilliant and somewhat fantastic decoration in color applied to standing bed-places, wardrobes, and the cases of tall clocks. (See Zell, *Bauern-Möbel*.) In Holland, in consequence of the strong feeling for landscape art, resulting from the achievements of the Dutch seventeenth-century painters, such pieces of furniture as were susceptible of it were often covered with landscape painting, or, the panels being painted thus, the uprights were covered with floral decoration.

The course of natural development and change in all matters of decorative art was broken rudely by the French Revolution, and the political changes and aspirations which it brought with it. Even in France, where the instinct for fine art applied to the purposes of daily life was far more powerful than elsewhere, the years from 1800 to 1850 were marked by ill-calculated attempts to secure novelty, and by continued decline. The famous style of the Empire was almost wholly the creation of two or three designers trying to please Napoleon I., and it deserves little of the attention it has received in late years. (See De Champeaux in bibliography.) In the rest of Europe the furniture of the years before the great Exhibition of 1851 was clumsy and funereal in aspect, and generally tasteless in decorative detail. With the close of this epoch began the years of rapid and cheap manufacture of furniture in large factories, by means of which the requisite bedsteads, tables, and chairs of what might be thought elegant appearance were turned out at a surprisingly low price. No refinement of design is possible in such work as this where a vast number of pieces are made from one design, itself calculated to offend no one and to seem respectable to many rather than attractive to one person. The consequence of this rapid and cheap manufacture is that even the little hand work that is done tends to share the same characteristics of design, and a general reign of bad taste is the inevitable consequence. A reaction begins every few years, and has a little effect; it passes out of general notice, and is succeeded by another movement for bettering the condition of things. Thus, the Morris furniture of 1865 and following years was

an attempted return to great simplicity of parts, an obvious constructive character in all the designs. Partly founded upon this, a system of design existed in England from 1875 to the close of the century, in which no past style could be said to dictate the disposition, but common sense and utility were carefully considered; all this, however, without great charm of form or delicacy of detail. On the Continent the forms of the eighteenth century were repeated again and again with generally a negative good taste seen in their use, but without anything very attractive—the furniture might be inoffensive, but it was without charm. On the whole, the best thing that the years from 1850 have to show is the work done by the few upholsterers, furniture-makers, and decorators of considerable pretensions and doing a large business even at high prices. Some of the designs turned out by such houses in the American cities, as well as in the principal cities of Europe, are really of surprising elegance and fitness for their purpose, but all this is done at prices which put such furniture wholly out of the reach of all but a few wealthy householders. The attempts made since 1895 to create what is called a new art are as yet too recent to be judged; it may be said, however, that the use of abstract curves, however appropriate to metal-work or to mural painting, has less application to wood on account of the very nature of the material, its strength lying in the direction of its straight parallel fibres. There is still no school of good furniture; the only chance of obtaining any is to employ a designer of individual force and large acquaintance with past styles, and to have his designs carried out by first-rate workmen.

BIBLIOGRAPHY. The general history of furniture is traceable in Racinet, *Le costume historique* (London, 1876), as the plates and text of that work deal with the whole life of the peoples whose costume is considered. To a less extent this is true of the lesser works named in the bibliography under **COSTUME**; also Viollet-le-Duc's *Histoire de l'habitation humaine* (Paris, 1875). The illustrated history of furniture by Frederick Litchfield (London, 1893) attempts to cover the whole subject, but is, in the main, a compilation. It is valuable for reference. For antiquity, consult the plates of the works named in the bibliography under **ASSYRIA**, **EGYPT**, and other articles; also Perrot and Chipiez, *Histoire de l'art dans l'antiquité* (Paris, 1882 et seq.), of which seven volumes had appeared in 1892, those for the historic ages of Greece and for Roman art not having appeared; for furniture since the beginning of the Middle Ages, De Champeaux, *Le meuble* (Paris, 1885), which forms two volumes of the *Bibliothèque de l'Enseignement des Beaux-Arts*, and is an excellent work showing great knowledge of the subject; also Jacquemart, *Histoire du mobilier* (Paris, 1876); *Ancient and Modern Furniture and Woodwork in the South Kensington Museum*, with an Introduction by Pollen (London, 1874). For special epochs, consult: Viollet-le-Duc, *Histoire du mobilier français*; Zell, *Bauern-Möbel aus dem bayerischen Hochland* (Frankfort, 1899), a folio with valuable colored plates; for English oak of the sixteenth and following centuries, Sanders, *Half-Timbered Houses and Carved Woodwork* (London, 1894); Hurrel, *Measured Drawings of*

Old Oak Furniture; and several other books, consisting chiefly of plates; also for the Georgian period, Lyon, *The Colonial Furniture of New England* (Boston, 1891); Singleton, *The Furniture of Our Forefathers*, with description of the plates by Russell Sturgis (New York, 1900); Lockwood, *Colonial Furniture in America* (New York, 1901); Morse, *Furniture of the Olden Time* (New York, 1902). For Japan, consult Morse, *Japanese Homes and Their Surroundings* (Boston, 1886); for the Orient, Lane, *An Account of the Manners and Customs of the Modern Egyptians* (London, 1871), and books of travel in the nearer East; also the numerous notes added to Sir Richard Burton's translation of *The Thousand and One Nights* (London, 1886-87), and the text of this and other literal and minute translations from books written in Oriental languages.

Numerous volumes of large plates, photographic and other, including catalogues of famous sales and of temporary expositions, universal and local, furnish an unlimited supply of illustrations of furniture, sometimes accompanied by valuable comment. See **BOULLE**; **CHIPPENDALE FURNITURE**; **SHERATON**; **RIESENER**, etc.

FURNIVALL, fūr'nī-val, **FREDERICK JAMES** (1825—). An English philologist. He was born at Egham, Surrey, England, February 4, 1825, and was educated at University College, London, and at Trinity Hall, Cambridge, where he was graduated B.A. in 1846, and M.A. in 1848. He was called to the bar in 1849. For ten years he was associated in philanthropic work with F. D. Maurice, teaching in the Workingmen's College. Devoting himself to philology, he succeeded in founding, for the publication of texts, the Early English Text Society (1864), the Chaucer Society (1868), the Ballad Society (1868), the New Shakespeare Society (1874), the Browning Society (1881), the Wiclif Society (1882), and the Shelley Society (1885). He has been honorary secretary of the Philological Society since 1854, and for some years edited their great English dictionary. He has personally edited numerous works, chiefly through the medium of the above societies, one of the most notable being *A Six-Text Print of Chaucer's Canterbury Tales* (1868-75). This he followed with the publication of a seventh text, and the MSS. of Chaucer's minor poems. Under his supervision were published forty-three facsimiles of the quartos of Shakespeare's plays. His introduction to the *Leopold Shakespeare* has been extensively circulated. In 1884 he was granted a Civil List pension of £150. On his sixtieth birthday the University of Berlin conferred on him the honorary degree of Ph.D.; and on his seventy-fifth birthday he was elected member of the German Shakespeare Society.

FURNIVAL'S INN. One of the ancient inns of chancery, affiliated to the more famous Lincoln's Inn. It derives its name from Sir William Furnival, whose family became extinct in the reign of Richard II. The inn stood in Holborn, and came into the possession of the society in the first year of Edward VI. (1547). It had a long and honorable existence, but with the other chancery inns fell into disuse, and went out of existence about the middle of the eighteenth century. For a description of the various inns or guilds of lawyers and their functions, see **INNS OF COURT**.

FUROR. A madman, representing intemperance wrath, in Spenser's *Faerie Queene*. He and his mother, Occasion, are overcome by Sir Guyon, the Knight of Temperance.

FURRER, fūr'ēr, JONAS (1805-61). A Swiss statesman. He was born at Winterthur, and was educated at Zurich, Heidelberg, and Göttingen. In 1839, and again in 1844, he was president of the Grand Council, and in 1845 he was appointed president of the Cantonal Diet. As one of the foremost advocates of the new Federal Constitution, he was elected President of the Swiss Confederation upon its adoption. He was three times reelected, and was a member of the Federal Council until his death. He wrote a work entitled *Das Erbrecht der Stadt Winterthur* (1832).

FURBUCKABAD, fūr'rūk-a-bād'. See FA-BUKHABAD.

FURS. In heraldry (q.v.), one of the three classes of tinctures, the other two being metals and colors.

FURS, fōōrz, **FOBS**, fōrz, or **FURANI**, fōōrā'nē. The Moslem negroes dominant in Darfur (Fur Land), in Eastern Sudan, between Kordofan and Wadai. They are tall (1.730 mm., or 67 inches), very black and prognathic, and have woolly hair. Their language is related to Nuba, and they, with the Nubas and Nubians, are placed with the Nigritians, or negro race once dominant throughout Egyptian Sudan. The political history of the Furs, their dynastic wars of the sixteenth century, the prosperity of the monarchy under Solomon Solon at the beginning of the seventeenth, the ascendancy of Islam with the development of agriculture and other industries, the conquest of the country by the slave-dealer Zebehr Pasha in 1874, and the Mahdist revolt, 1881-92, are the prominent events in their history during the last four hundred years.

FURSCH-MADI, fōōrsh'māi'dē, EMMA (1847-94). A French singer, born at Bayonne. She studied at the Paris Conservatory, and first appeared in a symphony concert conducted by Padeloup. She created the title rôle in Verdi's opera *Aida* when it was first sung in French at the Théâtre de la Monnaie, Brussels. After this she sang in London with much success for three years. In 1884 she came to New York, and sang at the Academy of Music, under Mapleson's management. She was engaged by Henry E. Abbey for the Metropolitan Opera House, and appeared there for the last time as Ortrud in *Lohengrin* (February 6, 1894). She taught singing in the New York College of Music from 1891 until her death, at Warrentonville, N. J. Fursch-Madi was a great favorite in America, and was often heard in concert. She was three times married—first to M. Madior de Montjan, then to M. Verle, and lastly to Wurtz, the painter.

FUR-SEAL. See SEAL.

FÜRST, fūrst, JULIUS (1805-73). A distinguished German Orientalist, born of Jewish parentage, at Zerkow, Posen. He was educated for the rabbinical profession, and displayed at a very early age a remarkable power of acquiring knowledge. He studied at a gymnasium in Berlin, and entered the university there, but soon after returned to Posen, in 1825, to take a post as teacher. Gradually his convictions led him away from the faith of orthodox Judaism, and in 1829 he abandoned the idea of entering the ministry and pro-

ceeded to Breslau, where he continued his Oriental, theological, and antiquarian studies, which were completed at Halle, under Gesenius, Wegscheider, and Tholuck. In 1833 he went to Leipzig, where he was first tutor (1833), and from 1864 professor, in the university. His labors in the Oriental field now continued uninterruptedly until his death, in 1873. His chief works are the following: *Lehrgebäude der aramäischen Idiome* (1835), a work which brought the Semitic languages within the field of comparative grammar, then in its infancy; *Concordantiæ Librorum Sacrorum Veteris Testamenti Hebraicæ et Chaldaicæ* (1837-40), a painstaking revision of Buxtorf's *Concordance of the Old Testament*; *Hebräisches und Chaldäisches Handwörterbuch* (1857); and his *Geschichte der biblischen Litteratur und des jüdisch-hellenistischen Schrifttums* (1867-70). He also wrote a *Geschichte des Karäertums* (1862-65), compiled a *Bibliotheca Judaica* (1849-63), and was editor (1840-51) of *Der Orient*.

FÜRSTENAU, fūr'ste-nou, ANTON BERNHARD (1792-1852). A German flute virtuoso and composer for that instrument, born at Münster, Westphalia. He made numerous concert tours throughout Holland, Germany, and Russia, and in 1819 was appointed royal chamber-musician to the King of Saxony. In 1826 he accompanied C. M. von Weber upon the latter's ill-fated voyage to England. His works comprise more than 150 compositions for the flute. His son MORITZ (1824-89) was also a flute virtuoso and a writer on music. He became president of the Society of Musicians at Dresden and custodian of the department of music in the Royal Library (1852). As the result of his researches in the history of music and kindred topics he published *Zur Geschichte der Musik und des Theaters am Hofe zu Dresden* (1861-62); *Die Fabrikation musikalischer Instrumente im sächsischen Vogtland* (with T. Berthold, 1870).

FÜRSTENBERG, fūr'sten-bērk. A media-tized principality in Southern Swabia, now divided among Baden, Württemberg, and Hohenzollern. It gives its name to a noble family, branches of which exist in Baden and Austria. The Austrian family consists of the princes of Fürstenberg, whose estates are in Bohemia, and of the landgraves of Fürstenberg, who reside in Lower Austria. Other branches of the family are the counts of Fürstenberg, in Westphalia and Rhenish Prussia.

FÜRSTENBUND, fūr'sten-bunt (Ger., league of princes). THE. A league of German princes, formed about 1780, under Prussian leadership, to resist the encroachments of Austria. Its founding was almost the last important act of Frederick the Great, and was premonitory of the future strife between Austria and Prussia for preëminence in Germany; but the importance of the union was lost sight of, for the time, in the events of the French Revolution.

FÜRSTENWALDE, fūr'sten-väl-de. A town in the Prussian Province of Brandenburg, situated on the right bank of the Spree, 30 miles east-southeast of Berlin (Map: Prussia, F 2). It has a gymnasium, several fine churches, and monuments to Emperors William I. and Frederick III. There are manufactures of woollens, electric lamps, etc. Owing to its ownership of an adjoin-

ing forest, 19 square miles in extent, Fürstenwalde is, in proportion to its population, among the richest towns in Germany. Population, in 1890, 12,900; in 1900, 16,662, chiefly Protestants. It is one of the oldest cities of Brandenburg, having obtained municipal rights in 1285.

FURTADO, foor-tá'do, FRANCISCO JOSÉ (1818-70). A Brazilian statesman. He was born at Oeiras (Piahy), and was educated at the Academy of Law at Caxias, Province of Maranhão, where he subsequently occupied the highest municipal offices. During the three years of his administration as President of Amazonas (1856-59), the new province had a marked development. Still more efficient were his labors in behalf of the restoration of the finances after his appointment as Minister of State in 1864. He was a resolute opponent of slavery, and as a member of the Senate in 1870 was instrumental in securing the adoption of the initial legal measures toward its abolition.

FÜRTH, furt. A town of Middle Franconia, Bavaria, situated at the confluence of the Rednitz with the Pegnitz, five miles northwest of Nuremberg (Map: Germany, D 4). It has a modern Rathaus, built in Italian style, with a lofty tower, and a seventeenth-century synagogue. In the Church of Saint Michael there is an excellent late-Gothic ciborium. Fürth vies with Nuremberg in the manufacture of the famous 'Nuremberg Goods.' Among its chief manufactures are accordingly mirrors, toys, gold leaf, bronzes, spectacles and optical instruments, wooden articles, etc. The trade in these manufactures and in hops is very active and extensive. Population, in 1890, 43,206; in 1900, 54,142, including 12,480 Roman Catholics, and 3017 Hebrews. Although mentioned as early as the beginning of the tenth century, Fürth did not obtain a municipal charter until 1818. It was burned by the Croats in 1634, and passed from Prussia to Bavaria in 1806. At the Alte Veste, three miles southwest of the city, Gustavus Adolphus was defeated by Wallenstein in a memorable battle in 1632. The first steam railway in Germany was that between Nuremberg and Fürth, opened in 1835.

FURTHER INDIA. See INDO-CHINA.

FURTWÄNGLER, furt'väng-lër, ADOLF (1853-). A German archaeologist. He was born at Freiburg, and studied in his native city and at Leipzig and Munich. In 1876 he obtained the scholarship of the German Archaeological Society, which enabled him to travel for two years abroad. During his sojourn in Greece (1878-79) he participated in the archaeological excavation at Olympia. Afterwards, with the exception of four years at the University and Museum at Berlin (1880-84), he occupied the chair of archaeology at Munich. Besides several valuable treatises on the excavations at Olympia, and various descriptive catalogues of the vases and other antiquities in the museums at Berlin and Munich, his publications include: *Plinius und seine Quellen über die bildenden Künste* (1877); *Meisterwerke der griechischen Plastik* (1893, Eng. trans. 1894); *Ueber Statuenkopien im Altertum* (1896).

FURY AND HEC'LA STRAIT. A narrow channel in the Arctic regions, lying in latitude 70° N. and longitude from 82° to 86° W., which separates Melville Peninsula on the south

from Cockburn Island on the north, and connects Fox Channel on the east with the Gulf of Boothia on the west (Map: Canada, O 3). According to its discoverer and explorer, Captain Parry, it is impassable on account of the accumulated ice with which it is packed. It received its name from the vessels used by Captain Parry on his voyage in 1822.

FURZE, fûrz (AS. *fyrz*, of unknown origin), *Ulex*. A genus of plants of the order Leguminosæ. The common furze (*Ulex Europæus*), also called whin and gorse, is a shrub about two or three feet high, extremely branched; the branches green, striated, and terminating in spines; the leaves few and lanceolate; the flowers numerous, solitary, and yellow. It is common in many of the southern parts of Europe, and in Great Britain, although it does not reach any considerable elevation on the British mountains, and often suffers from the frost of severe winters. Furze is sometimes planted for hedges, but is not well suited for the purpose, occupying a great breadth of ground, and not readily acquiring sufficient strength; besides, it does not, when cut, tend to acquire a denser habit. It is useful as affording winter food for sheep, and on this account is burned down to the ground by sheepherders when its stems become high and woody, so that a supply of green succulent shoots may be secured. It is sometimes cut and fed to other animals. A double-flowering variety is common in gardens. A very beautiful variety, called Irish furze, because originally found in Ireland, is remarkable for its dense, compact, and erect branches. A dwarf kind of furze (*Ulex nanus*) occurs in some places, and is perhaps only a mere variety; if so, there is but one species known.

FURZE-CHAT. See WHINCHAT.

FUSAN, foor'sin', or **PUSAN**. The chief seaport of the populous Province of Kiung-sang, in Southeastern Korea, seven miles from the mouth of Nan-tong River, in latitude 35° 6' N., longitude 129° 3' E., and the terminus of the railway from Seoul, of which the first section to Chon-yang was opened in October, 1902. The port was opened by treaty to Japanese trade in 1876, and to general trade November 26, 1883. The native town has about 600 houses, with a population of 5000 souls. The Japanese settlement is opposite Deer Island, under the control of the consul, assisted by the elective municipal council, and a police force in uniform of Western style. Locally, it is called Kan (the post), the Japanese having maintained a military post there since 1592. The town is supplied with water from the neighboring hills by pipes and hydrants. In 1902 there were 10,000 foreign residents, of whom 85 were Chinese, 22 Europeans, and the rest Japanese. The harbor is formed by several islands, the largest of which is Deer Island, and the largest vessels can come close to the landing-places. The tide rises seven feet. The climate is very healthful, summer bringing perfect sea-bathing. There are hot springs at Tong-nai, a city distant eight miles, and the local centre of trade, with a population of 33,160. Lines of steamers connect Fusan with Japan, Shanghai, and Vladivostok. A submarine cable to Nagasaki has been in operation since November, 1883. The chief imports are cotton

goods, petroleum, and Japanese manufactures; the exports are hides, beans, dried fish, whale-meat, and rice. In 1899 the imports amounted to \$2,389,000, and the exports \$1,822,000, against \$4,700,000 in 1897. Consult Bishop, *Korea and Her Neighbors* (New York, 1898).

FUSARO, fŭ-zŭ'rŏ, LAKE. A lake, $3\frac{1}{2}$ miles long, in the Province of Naples, Italy, one-half mile west of Baja and one and one-quarter miles south of the ruins of Cumæ (q.v.), of which it was perhaps the harbor (Map: Italy, C 11). It has always been famous for its oysters, and the restaurant and gardens of the Ostricoltura, and the casino built on the lake by Ferdinand I., have many visitors in spring and autumn. The ancients called it Acherusia Palus. Two canals connect it with the sea.

FUSBERTA, fŭz-bĕr'tă. The name of Rinaldo's sword in Ariosto's *Orlando Furioso*.

FUS'BOS. The Minister of State, who kills Bombastes, in Rhodes's burlesque *Bombastes Furioso*.

FUSE. See FUZE.

FUSEE, fŭ-zĕ' (from OF. *fusee*, thread, from ML. *fusata*, spindleful, from Lat. *fusus*, spindle). A spirally grooved cone in a watch or chronometer, connected at its base with a chain which is wound up on the pyramidal cone. The opposite end of this chain is attached to the box containing the spring, which rotates by the force of the uncoiling spring. The object of the peculiar form of the fusee is, as the force of the spring is weakened by uncoiling, to give a longer leverage at the other end of the chain (on the fusee), and so to counteract the loss of power in the spring, thereby maintaining as nearly as possible a uniform rate of driving force. See WATCH.

FUSEL (fŭ'sel) OIL, or **FOUSEL OIL** (Ger. *Fusel*, spirits of low grade; perhaps from Lat. *fusilis*, fluid, from *fundere*, to pour). A frequent impurity in spirits distilled from fermented potatoes, barley, rye, etc., to which it communicates a peculiar and offensive odor and taste, and an unwholesome property. (See ALCOHOL.) It is obtained from impure spirits in the form of an oily liquid having a penetrating odor, boiling at 131° to 132° C., and having a specific gravity of about 0.811 at 19° C. It has a much stronger intoxicating effect than ordinary alcohol, and is highly injurious to health. The substances found in fusel oil belong to three classes of carbon compounds—viz. alcohols, acids, and esters. The alcohols of fusel oil include: Methyl alcohol (wood spirit, CH_3OH); ethyl alcohol (spirits of wine, $\text{C}_2\text{H}_5\text{OH}$); propyl alcohol ($\text{C}_3\text{H}_7\text{OH}$); isobutyl alcohol ($\text{C}_4\text{H}_9\text{OH}$); amyl alcohol ($\text{C}_5\text{H}_{11}\text{OH}$); and hexyl alcohol ($\text{C}_6\text{H}_{13}\text{OH}$). The acids found, either free or combined in fusel oil, include: Formic acid (HCO_2H); acetic acid ($\text{CH}_3\text{CO}_2\text{H}$); propionic acid ($\text{C}_2\text{H}_5\text{CO}_2\text{H}$); butyric acid ($\text{C}_3\text{H}_7\text{CO}_2\text{H}$); valeric acid ($\text{C}_4\text{H}_9\text{CO}_2\text{H}$); caproic acid ($\text{C}_5\text{H}_{11}\text{CO}_2\text{H}$); α -naphthyl acid ($\text{C}_6\text{H}_5\text{CO}_2\text{H}$); caprylic acid ($\text{C}_7\text{H}_{13}\text{CO}_2\text{H}$); pelargonic acid ($\text{C}_8\text{H}_{17}\text{CO}_2\text{H}$); and capric acid ($\text{C}_9\text{H}_{19}\text{CO}_2\text{H}$). The principal constituents of fusel oil are the amyl alcohols. The composition of fusel oil contained in different spirits varies with the source from which the spirits are derived. Fusel oil is used in making artificial fruit essences and in the manufacture of alkaloids. See AMYL ALCOHOLS; DISTILLED LIQUORS.

FUSELI, fŭ'ze-lĕ, HENRY. See FÜESSELI.

FUSHIKI, fŭ-shĕ'kĕ, or **FUSHIGI**. A sea-port town of Japan, situated on the western coast of Nippon, 32 miles northeast of Kanazawa. It was made a free port in 1889. Population, about 19,000.

FUSHIMI, fŭ-shĕ'mĕ. A town of Japan, situated on both banks of the river Uji-gawa, $3\frac{1}{4}$ miles from Kyoto (Map: Japan, D 6). It is noted as the place where a battle occurred between the Imperialists and the adherents of the Shogun, in January, 1868. Population, in 1898, 21,515.

FUSIBLE METAL. A term applied to certain metallic alloys characterized by the relatively low temperatures at which they melt. Among the more important of these alloys are d'Arcet's metal, Rose's metal, Wood's metal, and Lipowitz's metal. *D'Arcet's metal* consists of 8 parts of bismuth, 8 parts of lead, and 3 parts of tin; it melts at 79° C. (174.2° F.). *Rose's metal* consists of 1 part of lead, 1 part of tin, and 2 parts of bismuth; it melts at 94° C. (201.2° F.). *Wood's metal* consists of 4 parts of tin, 3 parts of cadmium, and 15 parts of bismuth; it melts at 60° C. (140° F.). *Lipowitz's metal* consists of 8 parts of lead, 4 parts of tin, 3 parts of cadmium, and 15 parts of bismuth; it melts at 65° C. (149° F.). Of course, by varying the relative composition of these alloys a variety of other fusible metals may be obtained, and the melting-points of these may be made to answer the purposes for which they are intended. For example, the constituents of d'Arcet's metal may be mixed in the proportion of 5 parts of lead, 8 parts of bismuth, and 3 parts of tin, and then the melting-point will be 94.5° C. (202.1° F.). Many fusible metals, especially d'Arcet's, have the property of expanding as they cool, while still soft, and are therefore used for taking proof impressions of dies, each line being exactly reproduced in the cast made of the alloy. Fusible metals have also been employed for making safety plugs for boilers. When the steam reaches a pressure corresponding to the melting-point of the alloy, the plug gives way and the steam escapes. It is found, however, that the melting-point of the alloys is liable to change, and hence these metallic safety plugs are hardly reliable. See HEAT.

FUSILIERS, fŭ'zil-ĕrz' (Fr. *fusilier*, from *fusil*, musket, It., ML. *foclie*, steel for striking fire, from Lat. *focus*, hearth). Historic regiments of the British Army, deriving their title from the fact that they originally carried a lighter fusil or musket than the remainder of the army. In point of age the fusilier regiments are next in seniority to the Coldstreams and other guard regiments, and consequently are more or less prominent in the military history of Great Britain. In time of peace their uniform differs from other infantry regiments only in the matter of headgear, which in their case is a busby (q.v.) similar, though smaller, in shape to the one worn by the Footguards.

FUSING-POINT. See HEAT.

FUSION. See HEAT.

FUSION (Lat. *fusio*, fusion, from *fundere*, to pour). A concept which has played a large part in recent psychological discussion, but the mean-

ing of which cannot be said to be finally and precisely settled. It denotes a connection of sense elements of an extremely intimate kind—a connection so close that the resultant compound process seems rather to be a fusion or weld than a mere association of elements. The best instance of a fusion is the sound of a musical note or clang in which a number of tonal elements are blended to give a single resultant perception which, in certain cases, may counterfeit the simplicity of sensation itself. See CLANG-TINT.

Fusion, as thus defined, might be nothing more than a limiting form of simultaneous association (q.v.). Wundt accordingly classifies simultaneous associations as: (1) Fusions (intensive, e.g. tones, and extensive, e.g. sights and touches); (2) assimilations, including discrimination and recognition; and (3) complications, connections of elements from different sense departments (e.g. of visual impressions and the organic sensations accompanying bodily movement). As thus understood, fusion does not necessarily imply any change in the connected sensations. We may suppose that they are intimately associated, owing to their habitual and constant concurrence; some one of them dominates the group, forcing the others into obscurity, so that the whole is apprehended as a whole, and not as a sum; but still analysis is possible, and when it takes place the obscure components may turn out to be the same in all respects as they would be if given in isolation. Fusion, in other words, might be merely a modern name for James Mill's indissoluble association. In point of fact, the question is more complicated.

(1) We must, in the first place, take account of Wundt's law of psychical resultants. This law declares that "every mental complex shows attributes which may, indeed, be understood from the attributes of its elements, when these elements have been once presented, but which are by no means to be regarded as the mere sum of the attributes of these elements." Thus the musical note or chord has attributes, on its perceptive and affective sides, which do not attach to the component simple tones. So, too, spatial and temporal arrangement—extension, duration, order in space or time—is conditioned upon a certain collocation of sense elements; but neither space nor time is an intrinsic attribute of any sensation. It follows, then, that for Wundt both the intensive and the extensive fusions are, in reality, something more than indissoluble associations; the fusion is not only a whole, but a new whole, something that can be understood but not predicted from the nature of its elemental constituents. The law of psychical resultants has been much criticised, on the ground that it involves a belief in 'mental chemistry' for which the facts give no warrant; on the ground, more particularly, that it is impossible to derive space from the non-spatial and time from the non-temporal. Nevertheless, many psychologists of high standing accept the doctrine of 'consolidated contents' or 'consolidated attributes'—the doctrine that associated complexes contain processes or show attributes which are set up by the association as such, and are not discoverable when the elements are separately examined; and this doctrine is but a variant of Wundt's law.

(2) The laws of tonal fusion have been worked out in great detail by Stumpf. This author is

very far from accepting a principle of mental chemistry; but, at the same time, he differentiates fusion from simple association. According to Stumpf, there is in a collocation of tones, after all other hindrances to analysis have been removed, a tendency to fusion, or to a resultant oneness of impression, due to the character of the sense material itself. When full allowance is made for habitual association, for misdirection or distraction of attention, for lack of practice, and what not, this 'sense phenomenon' of being fused still remains. It is not that a new process or attribute is set up; it is simply that, just as visual extents, owing to their intrinsic nature, associate, so do tonal qualities, owing to their nature as tones, fuse or blend. This position has recently been disputed; but the evidence for it is too strong to be lightly overthrown.

We turn to a consideration of the laws of tonal fusion. (1) If we grant Stumpf's postulate, it is clear that we may speak of *degrees* of fusion, according as the tendency to fusion, inherent in tonal material, is more or less completely realized. The musical interval of the octave may readily be confused, even by practiced observers, with a simple tone; the octave, then, represents the highest degree of fusion. On the other hand, the intervals of the major and minor second and major and minor seventh are rarely taken to be unitary, even by unpracticed and unmusical hearers; these intervals, then, represent the lowest degree of fusion. Between the two extremes stand, in order from better to worse fusion, the intervals of the fifth, of the fourth, of the major and minor thirds and sixths, and of the subminor or natural seventh and the tritone. We have, in other words, a scale of six fusion degrees within the octave of the musical scale. The facts are summed up in the primary fusion law that "the degree of fusion is a function of the vibration ratio of the component tones" (Stumpf). In general, the consonances are the best fusions, the dissonances are the worst, and the imperfect consonances occupy an intermediate position.

Certain other laws of fusion may be formulated as follows: (2) The dependence of intra-octave fusion upon the vibration ratio of the component tones persists over all regions of the musical scale. Above and below the limits of this scale the discrimination of degrees of fusion becomes difficult or impossible. (3) The degree of fusion is independent of the intensity, absolute and relative, of the component tones. A weak chord fuses as does a loud chord; and a loud tone, accompanied by weak tones, gives the same fusion degree as would be produced if the same tones were all sounded at equal intensities. (4) Stumpf asserts that the fusion degrees of intervals wider than the octave are identical with those of the corresponding intra-octave intervals. Thus, the "ninths have the same fusion as the seconds, the tenths as the thirds, the double octave and triple octave as the octave." This law is not generally accepted. We must, of course, not be misled by the fact that discrimination of the tones of the tenth, as compared with those of the third, is facilitated by the greater distance separating them upon the tonal scale. This has nothing to do with degree of fusion; our analysis may be made easier or more difficult by the concurrence of extrinsic conditions, while the

degree of fusion remains absolutely the same. The question is: When analysis of the third and of the tenth has been performed, and the observer is able by effort of attention to single out the component tones in both complexes, do the third tones 'go together' (blend) as well as or better than the tenth tones? Is the sense relationship, which we term fusion degree, the same or different in the two cases? The answer seems to be that the tenth, though a better fusion than, e.g. the tritone (a member of the intra-octave group lying next below the group of thirds and sixths), is still a worse fusion than the third, to which it corresponds. (5) Except in certain specific cases, falling under the laws already formulated, clang-tint does not influence degree of fusion. (6) Spatial separation of the tones, though it facilitates analysis, does not affect degree of fusion. (7) If two tones are simultaneously ideated (reproduced, as sounding together, in memory or imagination), the resultant idea always evinces the degree of fusion that the same tones would show in perception. (8) The pitch of a fusion is never that of a tone lying midway between the pitches of the component tones, but rather the pitch of some one of these components. "In a continuously sounding compound clang," as heard by a musical observer, "the whole appears to possess the pitch of its deepest tone, even if this be not the loudest" (Stumpf). Unmusical observers are apt to estimate the pitch of a simple clang as somewhat lower than that of a compound clang based upon the same fundamental tone.

Other instances of fusion are to be found in the complexes of organic sensation that form the body of the feelings (q.v.); in the qualitative taste-smell mixtures (the taste of coffee or lemonade); in the perceptions (weight, resistance) mediated both by external skin and by the sense organs of muscle, tendon, and joint; perhaps in all the impressions that we call colors (mixtures of color proper and of brightness); and, according to Kuelpe, in such affective formations as emotion, impulse, and feeling. It is, however, doubtful whether the connections of sensation and affection can be brought under the same conceptual heading as the fusion connections of sensations.

Consult: Stumpf, *Tonpsychologie*, vol. ii. (Leipzig, 1890); Wundt, *Grundriss der Psychologie* (Leipzig, 1897; Eng. trans., London, 1898); id., *Grundzüge der physiologischen Psychologie* (4th ed., Leipzig, 1893); Kuelpe, *Outlines of Psychology*, translated by Pillsbury and Titchener (London, 1895); Titchener, *Experimental Psychology* (New York, 1901).

FUSION DISK, or FUSING DISK. See METAL-WORKING MACHINERY.

FUSIYAMA, fōō'sé-yā'mā. See FUJIYAMA.

FUST, fōōst, or **FAUST**, JOHANN (?-c.1466). A German promoter of the invention of printing. He was a well-to-do citizen of Mainz, and became Gutenberg's partner in the new business of printing. He furnished the capital and took a mortgage upon the business, being shrewd enough to realize the value of Gutenberg's discovery. Gutenberg, on his part, provided the necessary apparatus. In 1455 Fust prosecuted Gutenberg for money advanced, and upon the latter's non-payment seized enough of the apparatus to cover the

mortgage, and continued the business with his son-in-law, Peter Schöffer. In 1462, at the sack of Mainz, the workmen were scattered and the secret of the art of printing became common property. By 1465 their shop was again active. Copies of the work of Fust and his partners are still in existence. The best-known publication of himself and Gutenberg is the Latin 'Bible of forty-two lines,' or the Mazarin Bible; of Fust and Schöffer, a *Psalter* (1457), the first book published with a complete date, and especially remarkable for the beauty of the initials, which are printed in red and blue from types made in two pieces. See GUTENBERG; PRINTING.

FUSTEL DE COULANGES, fus'tél' de kōō-lānz', NUMA DENIS (1830-89). A French historian, born in Paris. After teaching history in Amiens, Paris, and Strassburg, he returned in 1871 to Paris, where he became the successor of Geffroy at the university, and several years later was appointed to the chair of mediæval history (1878). His principal works are: *Mémoire sur l'île de Chio* (1857); *Polybe, ou la Grèce conquise par les Romains* (1858); *La cité antique, Étude sur le culte, le droit, les institutions de la Grèce et de Rome* (14th ed. 1895); *Histoire des institutions politiques de l'ancienne France* (1875-90); and *La Gaule romaine, l'invasion germanique et le royaume des Francs* (1888-91), which was awarded the *grand prix* 'Jean Raynaud.' For his biography, consult Guiraud (Paris, 1896).

FUSTIAN, fūs'chan (from OF. *fustaine*, from ML. *fustianum*, fustian, from Ar. *Fustāt*, a suburb of Cairo, from which the material first came). A cotton fabric which has a pile like velvet, but shorter, and which is manufactured in nearly the same manner as velvet, by leaving loops standing upon the face of the fabric, and then cutting them through so as to form upright threads, which are afterwards smoothed by shearing, singeing, and brushing. See VELVET.

The different names given to fustian cloths depend upon their degree of fineness, and the manner in which they are woven and finished. Thus, smooth kinds, of a strong twilled texture, are called *moleskins* when shorn before dyeing, and *beaverteens* when cropped after dyeing. Corduroy, or king's cord, is produced by a peculiar disposition of the pile-threads. In all fustians there is a warp and filling, or weft thread, independent of the additional filling-thread forming the pile; but in corduroys the pile-thread is only 'thrown in' where the corded portions are, and is absent in the narrow spaces between them. For a technical description of fustians, velveteens, and corduroys, see Posselt, *Technology of Textile Design* (Philadelphia, 1895).

FUSTIAN. See SYLVESTER DAGGERWOOD.

FUSTIC (from Fr. *fustoc*; ultimately connected with Lat. *fustis*, stick). A name given to two kinds of dye-wood used for producing a yellow color, and, with chemical additions, other colors, such as brown, olive, and green. The name in France (fustic) seems to be connected with fustet, name of the Venice sumac (*Rhus cotinus*), a shrub found in the south of Europe, and to have been transferred to a very different plant (*Chlorophora tinctoria*), a tree of the natural order Moraceæ, a native of the West Indies, Mexico, and Northern South America. Fustic is a large and handsome tree with wood which is

sometimes used in mosaic cabinet-work and turning, but chiefly in dyeing, for which its large content of yellow coloring matter specially fits it. Since the color is rather dull, it is more used for producing other colors. Old fustic, or yellow-wood, is employed for dyeing woollens and also to impart to them, when mixed with indigo and salts of iron, green and olive colors. It furnishes a yellow coloring matter termed moritannic acid, which may be obtained in crystals by evaporating its watery solution. The bichromates of potash and of lead, as well as some of the coal-tar products, have to a great degree superseded the use of old fustic. Young fustic, the wood of *Rhus cotinus*, contains a yellow coloring matter, to which the name fusteric has been given. It is generally used in combination with other dyes, in order to strike some particular tint. These terms, old and young, began to be employed about the beginning of the eighteenth century, from the mistaken notion that the one, in small pieces, was the wood of the young tree, and the other, in comparatively large logs, of the same tree in a more mature state. The osage orange (*Maclura aurantiaca*) of North America is nearly allied to old fustic, and its wood also affords a yellow dye. See OSAGE ORANGE; SUMACH.

FUSULINA, fū'sŭ-lī'nā (Neo-Lat., from Lat. *fusus*, spindle). An important genus of fossil perforate Foraminifera, characteristic of the Upper Carboniferous and Permian limestones. The shell, which varies in size from one-quarter to one-half inch among the different species, is usually fusiform in shape, and is made up of a number of spirally inrolled whorls, of which the chambers are divided into many chamberlets by primary and secondary partitions. The known species, about fifteen in number, are found in the Upper Carboniferous limestones, and often also in those of the Permian age, and in many places are so abundant that they actually constitute the mass of the rocks. Such Fusulina limestones, appearing as if made up of grains of wheat, are common in certain parts of Europe, Asia, Japan, and are also found in the Mississippian and Southwestern States of the United States and elsewhere in North America. The Fusulina limestone of Japan has a fine dark-gray ground with brighter colored Fusulina grains scattered over the surface, and because of its beauty has been extensively cut into vases and other ornamental objects, in which form it may be seen in nearly every collection of Japanese curios. Schwagerina, with shell of spherical form, is an allied genus of quite similar horizon and distribution. See FORAMINIFERA; CARBONIFEROUS SYSTEM.

FUSUS (Lat., spindle). A genus of large gastropod mollusks, the spindle-shells, allied to the British whelks and American conchs, and containing many well-known shells. For particulars and illustrations, see ROARING BUCKIE; SPINDLE-SHELL; WHELK.

FUTA-JALLON, fu'tā' zhā'lŏn', or **FOOTA-JALLON**. A mountainous region in West Africa, a part of French Guinea, and bordered by Senegal on the north and Portuguese Guinea on the west. Its area is about 42,500 square miles. Owing mainly to the elevation, which is about 4000 feet, the climate is rather favorable; and the fine forests lend beauty to the region. The Senegal, Gambia, and other rivers head within its

confines. It is a mineral district, furnishing copper, iron, and some gold. Its fertile soil produces coffee, rice, maize, and cotton. The country is well adapted for stock-raising, and the number of cattle is considerable. The territory is regarded as among the best in that part of Africa, but it is as yet little developed.

Futa-Jallon was divided into four administrative circles by the French in 1902, each circle being under the French commandant of the region. At the head of the native government are the princes, called Almami, of the two leading ancient families. Each prince rules for two years, and his powers are subject to the action of an assembly of nobles. The crowning of the Almami takes place amid great festivities in the university town of Fugumba, in the oldest mosque in the land. The capital is Timbo, a village of 1500 inhabitants, and interesting for its palaces. Tuba is the largest city. Labé, also, is important, and Sokokoro is in a charming locality. The population of Futa-Jallon is given as about 600,000, mostly Fulbe. They came from Senegal in the sixteenth century and subjugated the natives. (See FULAH.) In 1881 the French, through a representative of the French administration in Senegambia, first concluded a treaty of peace with the Almami rulers of Futa-Jallon. It was not, however, until 1893 that a French protectorate was established, and a firm footing secured in connection with the Government of French Guinea (q.v.). Consult: Dölter, *Ueber die Capverden nach dem Rio Grande und Futa Dschallon* (Leipzig, 1884); Noïrot, *A travers le Fouta-Diallon et le Bambouc* (Paris, 1885).

FUTA-TORO, or **FOOTA-TORO**, tŏ'rŏ'. A territory in West Africa, in the northern part of French Senegal. A portion of it was annexed by France in 1860. It is, for the most part, a level and fertile country, with extensive tamarind forests. There is iron ore, and considerable pig iron is produced. The estimated population is 114,000, chiefly Fulbe.

FUTTEHPUR, füt'te-pŭr'. See FATHIPUR.

FUTTIGARH, füt'ti-gŭr', or **FATHIGARH**. The military cantonment of Farukhabad (q.v.). Population, about 12,400.

FUTTYGURH, füt'ti-gŭr'. See FUTTIGARH.

FUTURE ESTATE. An estate in lands which is limited to come into possession and enjoyment at some time in the future. By the common law of England the number of such estates was strictly limited, being confined to reversions and remainders. These had the common characteristic of fitting exactly upon some precedent estate less than a fee simple, and could not take effect in derogation of a fee nor after an interval of time during which the fee was suspended or in abeyance. Thus a future gift to B one year after A's death, or to C one year from date, would, at common law, have been simply void, as not coming within the description of a remainder. See REMAINDER; REVERSION.

As a consequence of the ancient practice of conveying land to one man to the use of another, and as the result of the Statute of Uses, passed in the twenty-seventh year of Henry VIII. (1535), and of the Statute of Wills, five years thereafter, new classes of future estates of a more flexible character became possible. These were known as springing and shifting uses, and

executory devises. They consisted in future limitations, not coming under the description of remainders and reversions, but taking effect in the future without a preceding 'particular' estate, or in derogation of a preceding estate in fee. Thus a gift of land to the use of B, to take effect on the happening of some future event, or to the use of A and his heirs, and, in the event of B's returning from abroad, to the use of B and his heirs, would vest a future estate in B, the former as a springing use (q.v.), and the latter as a shifting use (q.v.). Either of these estates, if given by last will and testament, would take effect as an executory devise (q.v.). Though these distinctions are still valid in England and many of the United States, they have in many jurisdictions been abolished by statute, while in a few States, as in New York, all future estates of real property have been put on the same footing, even the fundamental distinction between remainders and the executory limitations above described having been done away with. In general, therefore, future estates of all kinds can now be directly created by deed as well as by last will and testament.

Strictly speaking, there can be no such thing as an estate in personal property, and it was formerly the law that the ownership of such property was indivisible. This meant that if a chattel, as a jewel or a leasehold estate, was given to one for life, it became his absolutely, and no legal interest therein could be given over to any one else. But by a series of judicial decisions of the last century in England and America this narrow rule of the common law has been changed, and it is now possible to create legal future estates, or interests, in personal property as well as in real. Such interests are not deemed to be remainders, however, even where they take effect, like legal remainders of real property, upon the determination of a precedent interest therein, but are classified as future interests of the executory type, like springing and shifting uses, and the like.

The foregoing enumeration exhausts the list of the future estates generally recognized in our legal system. Other rights in land looking to a future enjoyment thereof may, indeed, exist, but they all fall short of being estates or interests in the land, as those terms are understood in law. Of this character are rights of entry for condition broken, rights of forfeiture for waste or other cause, rights of escheat and eminent domain, and the right remaining in one who has conveyed away a qualified or limited fee. None of these reach the dignity of future estates, though one of them, the right of entry for breach of condition, has been rendered alienable by statute in England and a few of the United States. Of an intermediate character, also, are the respective interests of husband and wife in the estate of the other, while the relation of coverture continues. The 'inchoate' dower right of the wife and the curtesy 'inchoate' of the husband are not, strictly speaking, future estates, but they approach closely to that description. See ESTATE.

Future estates of all kinds are generally alienable by deed or will, and, if estates of inheritance, are transmissible by descent just like present estates. Though the property in which the estate is claimed is for the time being in the lawful possession of another, the future estate

is secure from loss or destruction. It is unaffected by any conveyance or other act of absolute ownership which the present, or particular, tenant may choose to exercise over it. In this respect it differs from a mere equitable interest, present or future, in property, which may be lost by conveyance of the property to an innocent purchaser. But all future estates that are contingent in character are subject to the rule against perpetuities, which renders void any future interest which is not to rest within a lifetime and twenty-one years after the date of the creation of the estate. See PERPETUITY.

FUX, fooks, JOHANN JOSEPH (1660-1741). A musical composer and theoretician, born at Hirtensfeld, in Styria. Until his appointment as organist at the Schottenkirche, Vienna, in 1696, nothing authentic is known of him. In 1715, having held several court offices, he was appointed first or head kapellmeister, an office which he held up to the date of his death, serving with marked favor under three successive emperors. His secular compositions, and his operas in particular, give little evidence of genius; his fame as a composer resting more on his sacred music, and especially on the celebrated *Missa Canonica*, a contrapuntal masterpiece written entirely in canon form. His treatise on counterpoint, written in Latin originally, and entitled *Gradus ad Parnassum*, was first published at Vienna in 1725, meeting with so much favor that by the year 1791 it had been published in English, French, Italian, and German. Haydn and Mozart are known to have studied and profited by it, while Cherubini, Aibrechtsberger, Piccini, Martini, Vogler, and numerous other well-known composers and teachers either adopted or sanctioned it. Although he wrote or composed over 400 works, few of them were ever published. He died in Vienna. A very excellent biography is Köchel, *Johann Joseph Fux* (Vienna, 1872).

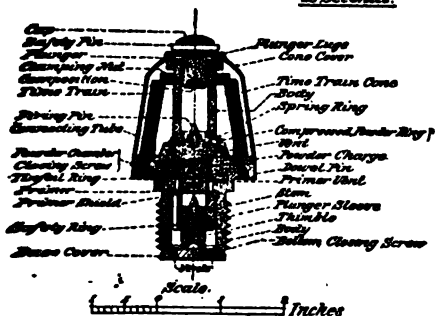
FUZE, or **FUSE** (abbreviation of *fusee*, from Fr. *fusil*, gun, steel for striking fire, It., *ML. focile*, steel for striking fire). The name of a variety of devices employed for firing explosives in military shells and mines and in blasting operations, etc. The simplest form of fuze, and the one which is most familiar, consists of a rope-like tube filled with some slow-burning compound, one end of which is inserted in the explosive, and to the other end of which the light is applied. Such fuzes are made to burn at a certain rate of speed, and the time of explosion can, therefore, be regulated definitely by varying the length of the fuze. The Bickford match, which is used in blasting, burns at the rate of from two feet to four feet per minute. In modern practice blasts are most generally fired by electric fuzes. These are of two general classes. In both two naked copper wires pass through a cork or plug of some non-conducting material, and project inside a metal cylinder in the open end of which the plug is inserted. In tension fuzes the ends of the wires are not connected, and in quantity fuzes the ends of the large copper wires are connected by a very fine wire, commonly of platinum. The metal cylinder is filled with some explosive compound, commonly fulminate of mercury, which explodes with a detonation. The outer ends of the two copper wires are connected with two wires which lead to the poles of a battery

or other electrical generator, often a magnetic machine.

In operation, the metal cylinder with its exploding charge is inserted in the mine or blast to be fired, and the wires are connected with the electric generator. Upon completion of the circuit the current passes through the explosive compound in the detonator, forming a spark in the tension fuze and heating the fuze wire in the quantity fuze, and in either case causing the compound to explode and thus explode the mine or blast. Electric fuzes are used for firing submerged mines in warfare. By means of the electric fuze a large number of mines or blasts can be fired simultaneously. See **BLASTING**.

Fuzes for projectiles are either time or percussion, or a combination of both. Percussion fuzes generally have a plunger held by a safety ring or other device away from a cap of fulminate until, by the shock of discharge, they are armed, and the plunger left free to run forward, when the shell strikes its target, and strike the cap. Time fuzes have a plunger held safe by a pin which is taken out when inserted in the gun; the discharge then shears off a frail support (the plunger lugs) and drives the plunger on to the cap at once, igniting a train of powder (time train) which burns during flight. Communication of flame to charge can be made only through the connecting tube, a small hole punched at a point corresponding to the time desired before explosion. The percussion principle is generally combined with this to insure explosion on impact if the time train should fail to act, and the mechanism which is shown in the illustration is generally situated at the base of the fuze.

F.A. Combination Fuze.
in Seconds.



FRANKFORD ARSENAL COMBINATION FUZE.

In spherical shell, a train of powder pressed into a wooden tube was cut to length proportionate to time of bursting. Ignited at the outer end by discharge, this tube conveyed the combustion to the charge. For ricochet fire over water, a water-cap of brass with a zigzag channel prevented extinction by immersion. An improved fuze, chiefly used for spherical shell, was the **Bormann**. It was of pewter and was punched on a time scale. Greater accuracy was obtained by more uniform burning of the better time train.

Consult **Bruff**, *Ordnance and Gunnery* (New York, 1900). See also **PROJECTILES**; **SHRAPNEL**.

FYFFE, *ff*, **CHARLES ALAN** (1845-92). An English historian, born at Blackheath, England, and educated at Balliol College, Oxford, where he graduated in 1868. He took his M.A. in 1870, and in the following year was elected a fellow of University College, and later was appointed bursar, which position he held for many years. He acted as war correspondent for the *London Daily News* during the early months of the Franco-Prussian War, and in the same capacity was in Paris during the Commune, narrowly escaping execution as a spy. He studied law at Lincoln's Inn and the Inner Temple in 1873-76, and in 1877 was admitted to the bar, but never practiced. In 1875 he published a small *History of Greece*, in a series of *History Primers*, which was well received. This success encouraged him to attempt a larger work, and he began writing his *History of Modern Europe*, which was published in three volumes in 1880, 1886, and 1890. It is a vigorous and careful account of the political history of Europe from the outbreak of the French Revolution to the Treaty of Berlin in 1878, and as a clear, concise, and well-proportioned sketch of this period it has not been surpassed. **Fyffe** was a Radical in politics, was one of the founders of the Free Land League, and was an unsuccessful candidate for Parliament from Oxford in 1885.

FYNE, *fin*, **LOCH**. An arm of the sea running north and northeast from the Sound of Bute, in the south of Argyllshire, Scotland, to beyond Inverary, in the north, and bounded by the District of Cowal on the east, and by those of Argyll-Knapdale and part of Cantire on the west (Map: Scotland, C 3). It is 43 miles long, 2 to 8 miles broad, and 40 to 70 fathoms deep, and receives at its head the waters of the Fyne River and a little lower down the Shira and Aray. It has important herring fisheries.

FYRD, *fêrd*. See **MILITIA**.

FYT, *fit*, **JAN** (c.1609-61). A Flemish painter and etcher, born in Antwerp. He was a pupil of Jan van Berch. In 1629 he became member of the Guild of Saint Luke, and in 1650 he was elected member of the Guild of the Romanists, becoming dean in 1652. He visited Italy and spent some time studying in Rome. His painting is characterized by sunny effects, harmony of color, and remarkable detail, especially in the painting of the fur of animals and the plumage of birds. His subjects embrace animals hunting, fighting, and dead. He has been named the greatest animal painter of the Flemish School, and was associated with Jordaens and Willeborts; the latter painted the figures, while **Fyt** added the animals. He died in Antwerp in 1661. His etchings include three series of animal subjects: they show the same vigor and animation in style as his paintings. There are three paintings at the Louvre, Paris; the "Bear Hunt" is in Munich; and he is well represented in Vienna and Paris.

FYZABAD, *fi'zâ-bûd'*. See **FAIZABAD**.

G

G The seventh letter and fifth consonant in the Græco-Roman alphabet. The greatest innovation made by the Romans when they took over the Greek alphabet was in the development of G. Up to the middle of the third century B.C. the letter C was employed in Latin inscriptions for both *c* and *g*. The familiar abbreviations C. and CN. for Gaius and Gnæus prove this fact beyond question. The inconvenience, however, of having only one character to distinguish the two sounds made necessary a slight differentiation, which finally gave the form G for the sonant guttural (*g*), and C for the surd guttural (*c* hard). The new character first appears in the epitaph on Scipio Barbatus, which Ritschl thinks cannot have been carved later than B.C. 234. This G took the seventh place in the alphabet, which had been occupied by Z in the old Italic alphabet. (See ALPHABET; LETTERS.) With reference to the name, it may be added that the Greek designation *gamma* has been usually supposed to be an adaptation of the Semitic *gaml* or *giml*, and to mean a camel. But in fact *giml* and *gaml* mean nothing as words, and although either may be the Semitic triliteral root meaning 'ripe,' there is no word of any such form from that root.

PHONETIC CHARACTER. In English, *g* has the values (1) of a voiced guttural explosive made by voiced breath being checked between the body of the tongue and the palate, as in *got*, *organ*, *glad*; (2) of the so-called 'soft' or palatal *g* (*d* + *zh*), as in *generous*, *gentle* (this sound is sometimes aided orthographically by the addition of a *d*, as in *bridge*, *judge*); (3) in some words taken from French it has the value of *zh*, the voiced, broad sibilant as in *mirage*, *rouge*; (4) it is sometimes silent before *n* and *m*, as *gnaw*, *sign*; (5) in the combination *ng* at the end of syllables it denotes merely that the *n* is a guttural and not a dental nasal; (6) the combination *gh* has frequently the sound of *f*, as *slough*, or of *w*, as *bough*. The voiced explosive *g* comes chiefly from (1) Indo-Ger. *gh*, as in Eng. *long*, Ger. *lang*, Lat. *longus*, Gk. *δολιχός*, Skt. *dirghas*; (2) the *g* of words which have come into English from other languages, as *grain*, Lat. *granum*. The following are some of the changes between *g* and other letters: *Acre*, Lat. *ager*, Gk. *ἄγρος*, or again *knee*, Lat. *genu*; *kin*, Lat. *genus*; *yester* (day), Ger. *gestern*, Lat. *hesternus*. There is a constant tendency toward

palatalization of *g*, as in the Old English participles in *y*, corresponding to Germanic *ge*. A modern instance of this tendency is seen in the pronunciation of *Morgen* as *Moryen* in the so-called *Berliner Dialekt* of Germany. The Normans in England could not sound the *w*, and so substituted for it *gu*. This gives doublets in English like *guard* and *ward*, *guarantee* and *warranty*. G sometimes disappears, as in Eng. *enough*, Ger. *genug*; and Eng. *master*, Lat. *magister*.

AS A SYMBOL. G in music is the fifth tone of the natural diatonic scale of C, and in the treble clef is written on the second line, or in the first space above. In the bass clef it stands in the first line or in the fourth space.

GAAL, gál, JÓZSEF (1811-66). An Hungarian author. He was born at Nagy Károly, in 1811; studied at the College of Buda, and at the University of Pesth, and entered soon afterwards the administrative career, being attached to the Hungarian Council of Lieutenancy. He played a somewhat important part in politics, and took part in the Revolution of 1848. Gaal began writing early, and proved equally successful when gossiping in the columns of Kossuth's famous *Pesti Hírlap*, translating a masterpiece of Cervantes, filling the periodicals with tales and novels, or furnishing original works for the National Theatre. The sketches of country life as it was, and as it still continues on the vast plains of Hungary, are nowhere more vividly and more truly exhibited than in Gaal's comedies and tales. The following are some of Gaal's original compositions: *Szirmay Ilona*, a novel in two volumes (1836); *Peleskei Notarius* (The Notary of Peleske, 1838), a comedy in four acts; *Szvatopluk*, a tragedy in five acts. Tales: *Pusztai Kaland* (An Adventure on the Hungarian Prairies); *Tengeri Kaland az Alföldön* (Seafaring Adventures in Lower Hungary); *Hortobágyi éjszaka* (A Night on the Heath of Hortobágy). During the sojourn of the Hungarian Diet at Debreczin (1849), Gaal was editor of a journal combating extreme radical views. As early as 1837 he was made a member of the Hungarian Academy. Consult the edition of Gaal's novels and tales by Badics (Budapest, 1880-82).

GABARET, gá'bá'rá', JEAN DE (c. 1620-97). A French Colonial Governor, born on the Island of Ré. He was made a commodore in 1653, and lieutenant-general of naval forces in 1689. At the siege of Tobago, West Indies, he was the

first to enter the harbor (February 27, 1677). He also fought in the battle of La Hogue (May 29, 1692), and in 1693 was appointed Governor of Martinique, which island he not only successfully defended against the English, but greatly improved. He improved the 'Black Code,' and, in the interest of the slave population of the island, submitted a report outlining a method of gradual emancipation, and at the same time recommending the deportation of the negroes to the French possessions in South America, where they might ultimately prove valuable as colonists, and pointing out that white immigration to Martinique would thus be encouraged.

GABB, WILLIAM MORE (1839-78). An American paleontologist. He was born in Philadelphia, where he attended the Academy of Natural Sciences. From 1862 to 1865 he was in charge of the paleontological branch of the geological surveying expedition in California under Josiah D. Whitney, and in 1868 and 1873 undertook geological surveys in Santo Domingo and Costa Rica. His principal publications, which refer chiefly to these expeditions, include the first and second volumes of the *Geological Survey of California* (1864); "On the Topography and Geology of Santo Domingo," in *Transactions of the American Philosophical Society* (1873); "On the Topography of Costa Rica, with Map," in *Petermann's Mittheilungen*; and "Ethnology of Costa Rica," in the *Transactions of the American Philosophical Society*.

GAB'BATHA (Gk. Γαββαθά). A proper noun found in John xix. 13, as the Aramaic equivalent of the Greek term Λιθοστρότος, *Lithostrōtos*, Pavement. The Aramaic word represented by the Greek is generally supposed to be *gabbeta*, the status emphaticus of *gabba*, a height or eminence. No such word has yet been discovered in extant Aramaic documents, and the derivation and exact meaning of the term are uncertain. The same uncertainty must be confessed in regard to the location of the 'Pavement' in the city of Jerusalem. No mention of the same is found in other writers, nor is the place where Jesus was tried by Pilate certainly known.

GABBRO (dialectic It., of obscure origin). A crystalline igneous rock of granitic texture, composed largely of the minerals lime-soda feldspar and pyroxene, but often containing also a considerable quantity of olivine. The average chemical composition is silica, 49 per cent.; alumina, 20 per cent.; iron sesquioxide, 3 per cent.; iron protoxide, 7 per cent.; magnesia, 7 per cent.; oxide of lime, 9 per cent.; oxide of sodium, 3 per cent.; water, 2 per cent. The proportions of the constituent feldspar and pyroxene in gabbros vary widely, hence they grade toward peridotite and pyroxenite (qq.v.) on the one hand by reduction of the proportion of feldspar; and on the other toward anorthosite (q.v.), by reduction of the proportion of pyroxene. Gabbro which contains olivine is distinguished as *olivine gabbro*. The usual pyroxene of gabbro is diallage, but when the place of this mineral is partially or wholly taken by hypersthene the rock is known as a *hypersthene gabbro* or *norite*. The processes known as weathering tend to change both the olivine and pyroxene of olivine gabbros into the hydrated magnesium silicate serpentine, hence olivine gabbros are very often

found to alter to serpentinous or serpentine rock (q.v.); the alteration is even more common and complete in peridotite (q.v.). Gabbros have a very large development in the Lake Superior region of America and in the western isles of Scotland. The word gabbro is used in Italy, and is said to have been introduced into geological science by Von Buch in 1809.

GABELENZ, gä'be-lents, HANS CONON VON DER (1807-74). A distinguished German philologist, born at Altenburg. He studied at the universities of Leipzig and Göttingen (1825-28), and held various positions in the Government of Saxe-Altenburg, rising in 1848 to the head of the Ministry. He devoted himself to the study of little-known languages, Asiatic, African, and American, and strove to lay a foundation for the comparative study of all languages. In his work *Ueber das Passivum* (1860) he drew examples from two hundred and eight tongues. Among his other works are: *Eléments de la grammaire mandchoue* (1833); *Grundzüge der syrischen Grammatik* (1841); a critical edition of the Gothic translation of the Bible by Ulfilas, with a Latin translation and a Gothic glossary and grammar (in collaboration with J. Löbe, 2 vols., 1843-46); *Ueber die melanesischen Sprachen* (2 vols., 1860 and 1873). He was one of the founders of the *Zeitschrift für die Kunde des Morgenlandes*, and contributed to it and other periodicals many papers upon obscure languages and general philological science.

GABELENZ, gä'be-lents, HANS GEORG CONON VON DER, son of Hans Conon von der Gabelenz (1840-93). A German philologist, born at Poschwitz, Saxe-Altenburg. After studying law in Jena and Leipzig, and holding several State positions, he was appointed in 1878 professor extraordinary of Oriental languages at the University of Leipzig, and to a similar chair in the University of Berlin in 1889. Besides numerous contributions to the philological journal which his father had founded, he translated a Chinese work on 'The Absolute,' entitled *Thai-Ki-T'u*, and published (1876) a grammar of the Chinese classical language, *Chinesische Grammatik* (Leipzig, 1881); *Die Sprachwissenschaft* (1891); and *Handbuch zur Aufnahme fremder Sprachen* (1892).

GABELLE, gä'bel' (Fr., probably from AS. *gafol*, tax, from the Celtic; cf. Corn. *gavel*, tenure, Ir., Gael. *gabhair*, conquest, from *gab*, to give, to take; connected with Goth. *giban*, Ger. *geben*, Eng. *give*). A term originally used in France to designate every kind of indirect tax, but more especially the tax upon salt. This impost, first established in 1286, in the reign of Philip IV., was meant to be only temporary, but was declared perpetual by Charles V. Salt was made a Government monopoly, and every family in the kingdom was obliged to buy a certain weekly amount at a fixed price. The price varied in the different provinces. Those that were most heavily taxed were called *pays de grande gabelle*, and those that were least heavily taxed, *pays de petite gabelle*. *Les provinces franches* and *les pays rédimés* were those provinces which had purchased exemption from the tax. It was unpopular from the first, and the attempt to collect it occasioned frequent disturbances. It was finally suppressed in 1790. The name *gabelous* is, however, still given by the common people in France to tax-gatherers.

GABELSBERGER, gä'bel's-bêrg-ër, FRANZ XAVER (1789-1849). The founder of stenography in Germany. He was born and educated at Munich, and was long engaged as private secretary in the Ministry of the Interior in that city. After publishing various text-books and charts for schools, he devoted himself exclusively to stenography, repeatedly gave public exhibitions of his proficiency, and ultimately received the unqualified commendation of the Academy of Sciences. His method is based upon phonetics. The system has been widely adopted in Germany, and has been introduced also into about twenty-five European languages. His principal works are: *Anleitung zur deutschen Redenzeichenkunst* (1834; Eng. trans., by Henry Richter under the title of *Graphic Shorthand*, 1899), which has furnished the basis for all further investigations of the kind in Germany, and has passed through numerous editions; *Neue Vervollkommnungen in der deutschen Redeschreibekunst* (2d ed. 1849); and *Stenographische Lesebibliothek* (1838). A monument was erected to his memory in Munich in 1890.

GABERLUN'ZIE MAN, THE. A Scottish ballad which belongs to the early sixteenth century, and has been ascribed to James V. It concerns the fortunes of a wandering beggar.

GABES, gä'bès. See **CABES**.

GABES, GULF OF. See **CABES**, GULF OF.

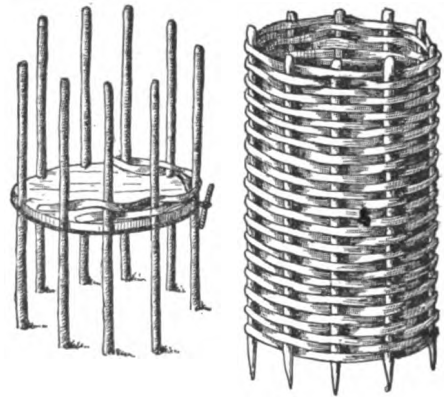
GABH'RA, BATTLE OF. A battle which the tribe of Fionn waged, about A.D. 284, against its enemies, as recounted by the Irish-Gaelic legends.

GABII, gä'bi-l. An ancient city of Latium, 10 miles east of Rome. It plays an important part in Roman legend, as the city where Romulus and Remus were educated, and later as conquered by Tarquinius Superbus. After this it is seldom mentioned, and though it was later a municipium, gradually fell into complete decay. It again became prosperous during the reign of Tiberius, when its cold sulphur springs attracted attention, and after the time of Hadrian seems to have flourished until the third century, when its name disappears except as the seat of a line of bishops until the ninth century. The principal relic of the ancient city is a ruined temple, probably dedicated to Juno, on a hill now crowned by the ruins of the medieval fortress of Castiglione. Excavations on the site have yielded many noteworthy works of art, as the "Artemis of Gabii" now in Munich. Quarries of an excellent building-stone, peperino, which was largely used by the Romans, existed in the neighborhood of Gabii. The Romans termed a peculiar method of girding the toga *cinctus Gabinus*. It seems to have differed from the ordinary method in that instead of the belt a portion of the toga was itself the girdle, while another part was drawn over the head. Used on certain solemn occasions, as the opening of the Temple of Janus on a declaration of war, and at certain sacrifices, it seems to have been brought to Rome from Gabii at an early date, along with other matters of augury or ritual.

GABINIUS, AULUS (?-c.47 B.C.). A Roman politician. He was tribune of the plebs. B.C. 66, and in that year proposed and carried the famous Gabinian law, conferring upon Pompey the command of the war against the pirates. Afterwards he was prætor (61), and became consul

in 58, when he supported the banishment of Cicero. At the end of his consulship he went to Syria as proconsul (57); invaded Egypt; and against a decree of the Senate, restored Ptolemy Auletes to the Egyptian throne (B.C. 55). On his return to Rome (54) he was accused of treason and extortion. He was acquitted of treason, but though defended by Cicero, was condemned to perpetual banishment for extortion. He was recalled by Cæsar in 49, and in the next year was sent to reinforce Q. Cornificius in Illyricum, where he died.

GAB'ION (OF., Fr. *gabion*, from It. *gabbione*, large basket, gabion, augmentative of *gabbia*, gabbia, cage, Fr., Eng. *cage*, from Lat. *cavea*, hollow place, from *cavus*, hollow). A device for strengthening earthworks, in field or temporary fortifications. It may be constructed of whatever materials the circumstances afford; but usually it is a hollow cylinder of basket-work, varying in diameter from about 20 inches to 6 feet, according to the nature of the work for which it is intended. It has the advantage of being readily portable and capable of many uses. See **FORTIFICATION**.



GABION.

GABIROL, gä'bä-röl', SALOMON BEN. See **AVICEBRON**.

GABL, gä'b'l, ALOYS (1845-93). An Austrian genre painter, born at Wiesen, Tyrol. He was a pupil at the Munich Academy of Schraudolph, Ramberg, and finally of Piloty. His poverty, the result of a disease of the eye, drove him to suicide at Munich. His genre scenes closely resemble in characterization and humorous conception those of his famous countrymen Defregger and Matthias Schmid, but surpass them in striking light effects. They include: "Recruiting in Tyrol" (1873); "His Reverence as Umpire" (1876); "A Munich Tavern" (1880); "Vaccination Room in Tyrol" (1885), the last in the New Pinakothek at Munich, and one of the choice specimens in that collection; and "Return of the Huntsman" (1892).

GABLE (OF., Fr. *gable*, from OHG. *gabala*, *gabal*, Ger. *Gabel*, fork, AS. *geaft*, fork, from Ir. *gabul*, *gobul*, Welsh *gaf*, Bret. *gavl*, *gaol*, fork). The triangular part of an exterior wall at the end of a building having a roof sloping both ways from a longitudinal ridge, between the top of the side walls and the slopes of the roof. The whole wall of which the gable forms the top is called a gable-end. The form appears first in

the pediment (q.v.) of Greek temples which, on account of its rich sculptures, became so important a part of temple architecture. It was not, however, until the Romanesque period of mediæval architecture that the gable came into general use as a constructive and decorative form. Some Romanesque gables in Central France, forming the summits of church façades, are extremely rich in ornamentation. Such gable façades throughout Europe became a decorative feature and often, instead of following the lines of the structure behind, were given independent lines, forming a screen façade. The form was extended, then, to minor parts of the building, often for purely decorative purposes. The development of tracery in the Gothic styles led to the use of delicate openwork gables, adorned with crockets and finials and covered with a lacework of decoration. Such gables—termed *gables* in their smaller forms—were used in great profusion in the more decorative parts of Gothic architecture, such as doorways, windows, canopies, pinnacles, etc., where they are introduced in endless variety. In the mediæval towns of Northern and Central Europe almost all the houses had gabled façades on the street, producing great diversity and picturesqueness of effect, as may still be seen in many towns which have been little modernized. The towns of Belgium and Germany especially still retain this mediæval arrangement. In the Gothic and the Renaissance periods, the simple outline of the gable in these countries became stepped and broken in the most fantastic manner. See CORBIE STEPS.

GABLENZ, gä'blents, LUDWIG KARL WILHELM, Baron (1814-74). An Austrian general. He was born at Jena, Saxe-Weimar; entered the Austrian service in 1833, and fought in Italy and Hungary in 1848. In the war of 1859 against Italy, he took a distinguished part in the battles of Magenta and Solferino; commanded the Austrian army corps in the Austro-Prussian War against Denmark in 1864, at Trautenau, and won the only Austrian victory of the War of 1866 against Prussia. After Sadova he became a member of the Austrian Upper House, was appointed commanding general in Hungary in 1869, and retired in 1871. Financial difficulties drove him to suicide.

GABLONZ, gä'blönts (Bohemian *Jablonec*). A busy manufacturing town of Bohemia, Austria, situated in a mountainous district about 1650 feet above sea-level, on the Neisse, seven miles east-southeast of Reichenberg (Map: Austria, D 1). Gablonz is one of the centres of the Bohemian glass industry, its specialties being glass beads, buttons, and imitation gems. There are also manufactures of bronzes, textiles, belts, and colored papers. The expert firms number over 100. Mineral baths are found in the vicinity. Population, in 1890, 14,653; in 1900, 21,086.

GABOON, gä'bōon'. See GABUN.

GABORIAU, gä'bō're'ō', EMILE (1835-73). A French novelist who conspicuously made crime and its detection his subjects. He was born at Saujon, November 9, 1835. His first popular writings were humorous sketches contributed to minor Parisian journals. With little grasp of character or grace of style, with no true literary qualities indeed, he achieved a European reputation as a reviver of the romances of rascality, and

as an inaugurator of the detective story, in connection with which he made a careful study of the Paris police system of his day. His fiction was thus a direct reflection of phases of the French Romantic School. The best of his numerous and frequently translated volumes are: *L'affaire Lerouge* (1866); *Le dossier No. 113* (1867); *Monsieur Lecoq* (1869); *La corde au cou* (1873); and *La dégringolade* (1876). He died in Paris, September 28, 1873.

GABRIEL (Heb., Man of God). In the Jewish angelology, one of the seven archangels. His function seems to be especially to reveal God's will and purposes. He appears in the Book of Daniel as the interpreter of the prophet's vision regarding the ram and the he-goat (viii. 16), and as bringing the explanation of the seventy weeks (ix. 21). In the New Testament he announces to Zacharias the birth of John the Baptist (Luke i. 19), and to Mary the birth of Christ (Luke i. 26). In post-biblical Jewish literature Gabriel is frequently introduced. The Targum to II. Chron. xxxii. 21 says that Gabriel destroyed the host of Sennacherib. According to the Talmud, it was he who showed Joseph the way to his brothers (Gen. xxxvii. 15-17), and he together with other angels buried the body of Moses (Deut. xxxiv. 6). He is the prince of fire, and the spirit who presides over the thunder and the ripening of fruits. When Nebuchadnezzar besieged Jerusalem, Gabriel is said to have entered the temple by command of God before the Assyrian soldiery, and burned it, thereby frustrating their impious intentions. It was he that prevented Vashti from obeying the King (Esther i. 12), and rewrote the record of Mordecai's service in the history after it had been erased. Gabriel has also the reputation among the rabbis of a most distinguished linguist, having, for example, taught Joseph the 70 languages spoken at Babel. The Mohammedans also hold Gabriel in great reverence. According to the claim of Mohammed in the Koran, it was he who revealed the sacred book. He is called the spirit of truth, and is regarded as the chief of the four most favored angels who form the council of God—a number corresponding to the system in the book of Enoch (ch. xl.), where Gabriel, Michael, Uriel, and Peniel are the angels standing near the throne of God.

GABRIEL, BROTHERS OF SAINT. An organization in the Roman Catholic Church founded in 1835 by a French priest named Deshayes (died 1841). Its purpose was the education of the young, especially the blind and deaf-mutes. By the year 1851 they had 91 houses; and in 1880 they conducted 122 elementary schools, 3 boarding-schools, 8 institutions for deaf-mutes, and 2 for the blind. Their mother house is at Saint Laurent-sur-Sèvre in La Vendée.

GABRIEL HOUNDS. A supernatural pack, which gives tongue at night, and thus gives warning of approaching sorrow. A peculiarity of the phenomenon is that the cry always seems to come from the sky instead of from the earth. The name is also applied to wild geese, whose noise when flying suggests that of hounds. They are introduced in Charles Reade's novel *Put Yourself in His Place*.

GABRIELI, gä'bré-ä'le, ANDREA (c.1510-86). An Italian organist and composer, born in Ven-

ice. He was a pupil in composition of Adrian Wil-laert, and became first organist of Saint Mark's in 1584. In 1574 he wrote the music for the reception of Henry III. of France, two cantatas for eight and twelve voices, respectively, printed in 1587. He was famed for his choral works, masses, motets, and madrigals, and was the first to write a fugue, a form hitherto not attempted by the contrapuntists. His best work is *Psalmi Davidici qui Pœnitentiales Nuncupantur* (1583). A number of his works were printed with those of his nephew Giovanni, such as some organ pieces, *Intonazioni d'organo* (1593, lib. i.), and *Ricercari per l'organo* (1595, lib. ii. and iii.).

GABRIELI, GIOVANNI (1557-1612). An Italian composer, born in Venice. He was the nephew and pupil of Andrea Gabrieli, and became the first organist at Saint Mark's (1585). He was the greatest representative of the contrapuntal school of the sixteenth century, and was considered the peer of Lasso and Palestrina, even surpassing the latter master in the richness of his tone-color. He was noted as a teacher, and had many scholars from Germany, where his compositions were early known and appreciated. He was one of the first to develop independent instrumental music in choral works. The early editions of his works are rare, but single pieces are to be found in many of the sixteenth and seventeenth century collections of music. His works are a *Benedictus* for 12 voices; *Psalmi Pœnitentiales 6 Vocum* (1583); *Madrigali a 6 voci o istromenti* (1585); *Madrigali e ricercari a 4 voci* (1587); *Ecclesiasticæ Cantiones 4-6 Vocum* (1589); *Sacra Symphonice*, for 6-16 voices or instruments (1597); another book for 6-19 voices (1615); and *Canzone e sonate a 3-32 voci* (1615). Consult Winterfeld, *Johann Gabriel und sein Zeitalter* (Berlin, 1834).

GABRIELLI, CATERINA (1730-96). An Italian opera singer. She was born at Rome, the daughter of a cook in the employ of Count Gabrielli, who, accidentally hearing her sing, adopted her as his protégée, and had her voice trained by Garcia and Porpora. Although possessed of a magnificent voice, and meeting with uniform success throughout her career as an artist, she is remembered more as the mistress of Don Ferdinand of Parma, and later as the companion of the profligate Catharine II. of Russia. Her artistic rivalry with Marchesi was felt so keenly in Milan as to lead to popular disturbances. She spent the last years of her life in Rome.

GABRIEL'S INSURRECTION. In American history, an insurrection of negro slaves in the vicinity of Richmond, Va., in August, 1800, organized by a young slave named Gabriel, for the purpose of murdering the whites. The plot was discovered, Governor Monroe ordered out the militia, and many of the blacks were captured and executed.

GABRILOWITCH, gâ-brê'ld'-vich, Ossip (1878-). A Russian pianist. He was born at Saint Petersburg, and when still a child entered the conservatory there. He became one of Rubinstein's favorite pupils, and after winning the Rubinstein prize in 1894, continued his studies with Leschetitzky in Vienna. Two years later he made his début at Berlin, and thereafter gave concerts in Russia, England, Austria, Sweden, and the United States. His first appearance in this country was in 1900, and then, as upon his

subsequent visits, he received an enthusiastic welcome. He is an exceedingly virile and sympathetic player.

GABUN, or GABOON, gâ-bōōn'. A river, or more properly an estuary, on the western coast of French Congo (q.v.), about 45 miles long and about 10 miles wide (Map: Congo Free State, A 2). It admits of the entrance of deep-draught vessels and formerly gave its name to the entire colony of French Congo. It receives the waters of the Como, and some minor tributaries.

GACHARD, gâ'shâr', LOUIS PROSPER (1800-85). A Belgian archivist and historian. He was born in Paris, removed to Belgium in 1830, and became a Belgian subject in 1831. In the same year he was made keeper of the public records. He was a member of the Belgian Academy, secretary of the Royal Historical Institution, and president of the Heraldic Bureau. Gachard traveled extensively in search of documents bearing on Belgian history, and published many authoritative works based on his researches. His principal writings are: *Correspondance de Guillaume le Taciturne* (1847-58); *Correspondance de Philippe II. sur les affaires des Pays-Bas* (1848-59); *Retraite et mort de Charles-Quint* (1854); *Relation des troubles de Gand sous Charles-Quint* (1856); *Don Carlos et Philippe II.* (1863); *Actes des Etats-généraux des Pays-Bas* (1866); *Histoire politique et diplomatique de Pierre-Paul Rubens* (1877).

GAD (perhaps an abbreviation of *Gaddiel*, Gad is god). According to the biblical account, a son of Jacob and his concubine Zilpah (Gen. xxx. 11), the eponymous ancestor of the tribe of Gad. This tribe was promised land on the eastern side of the Jordan on condition that they should help the other tribes to conquer the territory west of the river (Num. xxxii.). This condition they fulfilled (Joshua i. 12-18, iv. 12), and then settled in their own territory (Joshua xii. 1-9). It may be concluded from this tradition that Gad was a warlike tribe (see I. Chron. xii. 8), and secured its east-Jordanic settlement through conquest. The territories of the tribe are ill-defined. They lay between the settlements of Reuben on the south and those of Manasseh on the north, but there is a confusion in the biblical accounts, making it hard to determine the boundaries of the three tribes east of the Jordan. There is no literature preserved which originated in this region. When the kingdom was divided in the days of Rehoboam, Gad joined Jeroboam and the northern kingdom (I. Kings xii. 20). The tribe was taken captive to Assyria by Tiglathpileser (B.C. 734), and is heard of no more. The name Gad, like that given to his brother Asher, may have been originally the designation of a deity of good fortune, worshiped in various parts of Palestine. The fact that a Hebrew clan settled in the district which is embraced under the term Gilead in the broader sense is considered as pointing to the cult of this deity as the patron of the clan, whose connection with the other Hebrew tribes was never very close. The district contained, however, a number of ancient sanctuaries, such as Penuel and Succoth, which must at one time have been places to which pilgrimages were made. See ASHER; GILEAD.

GADAMES, gâ-dâ'mès, GHADAMES, or RHADAMES, râ-dî'mès. An oasis and town in

the Vilayet of Tripoli, North Africa, the centre of divergent routes to Tunis, Tripoli, Ghat, and Tidikelt, on the northern border of the Sahara, 310 miles southwest of Tripoli (Map: Africa, E 1). Gadames is an important entrepôt for manufactures and foreign goods from Tripoli to the interior, and for exports of ivory, beeswax, hides, ostrich-feathers, gold, etc., from the interior of Tripoli. Its gardens produce dates, barley, wheat, millet, etc., and are watered by the hot spring (89° Fahr.) from which the town had its origin. The climate is dry and healthful, though very hot in summer. A wall surrounds the oasis and town, and the streets are covered over for protection from the rain and sand storms. Gadames has six mosques, seven schools, and a Roman Catholic mission. Population, about 7000.

The town is the modern representative of the ancient city of Cydames, a stronghold of the Garamantes, the capture of which by Cornelius Balbus gave the Romans a great part of the wilderness. The town constitutes an ethnic menagerie. The inhabitants, living in well-guarded inclosures, include Berbers, Arabs, the *Atriya*, or negro freedmen, and emancipated half-castes, each group speaking its own language and also Berber as a common medium of intercourse. They are called 'born traders.' Consult Keane, in Stanford's *Africa*, vol. i. (London, 1895), for list of explorers and political history.

GAD'ARA. The modern Umm Keis, or Mkes, once a prominent city of Palestine, now in ruins. It was on the western extremity of a ridge of the Bashan plateau, six and one-half miles east of the Jordan, and six miles southeast of the Sea of Galilee. The site, 1194 feet above sea-level, commands a magnificent view of the Jordan Valley. At the foot of the ridge, three miles to the north, flows the Sheriat el-Menadireh, the ancient Jar-muk or Hieromax.

Gadara is first mentioned in the history of the Greek period. Josephus's statement that it was a Greek city implies that it was one of the many places in Palestine occupied by Greeks after Alexander's conquest. (See DECAPOLIS and PALESTINE.) Polybius states (v. 71, xvi. 39) that it was twice taken by Antiochus III. of Syria, in B.C. 218, and again in B.C. 198, in his wars with Egypt for the possession of Palestine. It remained nominally subject to Syria until about B.C. 100, when with other Greek cities east of the Jordan it was taken, after a ten months' siege, by the Jewish King, Alexander Jannæus, and partially destroyed. When Pompey reduced Syria to a Roman province (B.C. 65-63), he rebuilt Gadara, as a favor to his freedman Demetrius, a Gadarene. The restored city was thenceforward the fast friend of Rome. On its coins it made use of the Pompeian era in commemoration of Pompey's kindness. Augustus, after the battle of Actium, gave Gadara to Herod the Great, much against the wishes of its citizens. For its loyalty to Rome it suffered greatly at the hands of the revolted Jews in the war of 66-70 A.D. At the request of its wealthy citizens, Vespasian gave it a body of troops for protection against the Jews. From notices in ecclesiastical history it appears that it continued to flourish until the Mohammedan conquest.

The situation of Gadara was favorable for commerce, and it was a prosperous city, called by Josephus the metropolis of Perea. It was one

of the important members of the Decapolis (q.v.) and a centre of Greek culture. Meleager the poet, Theodorus the orator, Philodemus the Epicurean, Menippus the cynic, and others prominent in post-classical literature were Gadarenes. Its ruins are extensive and magnificent. It had two theatres, and the remains of the colonnade that once lined the main street are among the most remarkable in Palestine. Its water was supplied by an aqueduct from the Batanean hills, over 40 miles distant. The ancient cemetery east of the city is noted for the construction of its tombs, each with several separate chambers with doors swinging on stone hinges. The present inhabitants live in these tombs. In Roman times the city was famous for its warm springs. They are in the river valley, mainly on the north bank. About them quite a suburb grew up, Amatha by name, and extensive ruins of baths and other buildings of the once famous resort are now found there. The springs are still frequented by Bedawin, who consider the place neutral ground. Probably Gadara has no connection with biblical history. See GERASENES, COUNTRY OF THE.

GADDANE, gād-dii'nā. A wild Malayan people in Isabela and Cagayan provinces, Luzon. See PHILIPPINES.

GADDI, gād'dè. A family of Florentine painters. The founder was GADDO GADDI (c.1259-1332), famous especially for his mosaic pictures, especially the "Coronation of the Virgin" over the door of the Cathedral of Florence, the "Assumption" in the Cathedral of Pisa, and part of the mosaics in the dome of the Florentine baptistery. He was associated with Cimabue.—His son, TADDEO GADDI (c.1300-66), was a pupil of his godfather, Giotto, and preëminently the most talented of his followers. His masterpiece is the "History of the Virgin," in a series of frescoes in the Baroncelli Chapel at Santa Croce, Florence, in which he shows true religious feeling and poetry. Two signed altarpieces by him are at Berlin (1334), at Naples (1336), and others at Megognano, near Poggibonsi. The "History of Christ" and that of Saint Francis, on the presses in the sacristy of Santa Croce, are attributed to him. In his youth he assisted Giotto in the frescoes of Saint Francis at Assisi. As an architect he is reputed, mainly on Vasari's authority, to have continued Giotto's work on the Campanile at Florence, and to have built the Ponte Vecchio. The frescoes of the Cappella degli Spagnuoli, in the cloisters of Santa Maria Novella, are also attributed to him by Vasari. Modern authorities generally discredit these attributions. Many of his numerous works have perished.—His son, AGNOLO GADDI (1333-96), became, after his father's death, the pupil of Giovanni da Milano, and continued the artistic traditions of the family. His finest early work is the series of frescoes on the "Legend of the Virgin's Girdle" in the Cathedral of Prato, which illustrate the lighter, more picturesque and genre-like style which he affected, preparing the way for Masolino (q.v.) and other early Quattrocentists. His ability as a decorator and composer is even better illustrated by the series of the "History of the Finding of the Cross" in the choir of Santa Croce at Florence, with numerous realistic details, which are further important as having

inspired Piero della Francesca in his Arezzo frescoes. Consult: Vasari, *Delle vite de' più eccellenti pittori, scultori ed architetti*, edited by Milanese (Florence, 1878-85); Crowe and Cavalcaselle, *History of Painting in Italy*, vol. i. (London, 1864).

GADE, gä'de, NIELS WILHELM (1817-90). A distinguished Danish musician and composer, and the recognized founder of the Scandinavian school of music. He was born at Copenhagen, the only child of a cabinet and instrument maker, whose trade the son was required to adopt. Within a few months, however, the boy abandoned it, and made known his determination of becoming a musician. A course of study under the leader of the Court orchestra, Wexschall, and the practice and experience gained by his membership in the organization, enabled him at the age of sixteen to make his début as a concert violinist. He also studied theory under Berggreen, a well-known organist, and became a devoted student of the classics and a disciple of the new romantic school of music. In 1841 he won the prize offered by the Copenhagen Musical Association, submitting to the arbiters his first great composition, *Nachklänge von Ossian*. Aided by the King, he was enabled in 1843 to go to Leipzig to complete his studies, and in 1844 undertook, in the absence of Mendelssohn, the direction of the Gewandhaus concerts, becoming permanent conductor upon the latter's death in 1847. In 1850 he settled in Copenhagen, where he became organist, director of music, and master of the Chapel Royal. He was elected one of the foreign members of the Berlin Academy of Arts in 1874, and in 1876 the Danish Folkething voted life pensions of 3000 crowns to the two most eminent musical composers, selecting Gade as one. In addition to his prize compositions, he composed five symphonies, a quintet, an octet, and several vocal pieces, with orchestra, among them the well-known *Erl King's Daughter*; *The Springtide Phantasy*; *The Crusaders*; and many smaller compositions. He died at Copenhagen.

GADES, gä'déz. See CADIZ.

GADFLY, or **HORSE-FLY**. A fly of the family Tabanidæ, distinguished from other two-winged flies by having the last segment of the short antennæ ringed and not terminating in a bristle. The proboscis is fleshy, and envelops pointed horny processes by means of which the skin is punctured. The head is broad and short and the eyes are huge. About 1500 species are named. All are powerful fliers, and the females suck the blood of quadrupeds and man; although they, like the males, can also live on the sweets of plants. As an extreme adaptation the genus *Pangonia* of India and Nubia is remarkable, for the proboscis of the female is in some species three or four times as long as the body, and is stiff and needle-like, so that it can easily pierce thick clothing. The larvæ of the Tabanidæ are some of them aquatic; others live in the earth; others in decaying wood. Like the adults, they are predaceous, sucking the juices of insect-larvæ, of worms, and of snails. The pupa looks much like the chrysalis of a butterfly.

The common representatives of the Tabanidæ may be uniform black, with a bluish tinge, as in the case of the large mourning horse-fly (*Tabanus atratus*), or of medium size, with green

heads or golden eyes; the latter are also known as 'deer-flies.' To protect horses driven over infested roads—such as those passing through pine woods—netting should be used. An application of fish oil and carbolic acid to points not easily reached by the tail is recommended. Consult, in addition to works mentioned under **FLY**: Osten-Sacken, "Prodrome of a Monograph of the Tabanidæ of the United States," in *Memoirs of the Boston Society of Natural History*, vol. ii. (Boston, 1875-78); Williston, "Notes and Descriptions of the North American Tabanidæ," in *Transactions of the Kansas Academy of Science*, vol. x. (Lawrence, 1888).

GADIDÆ (Neo-Lat. nom. pl., from Neo-Lat. *gadus*, cod, from Gk. γάδος, *gados*, sort of fish). A family of soft-rayed fishes of north temperate and Arctic waters, including about 25 genera and 140 species. Except one genus (*Lota*), all are marine, and among them are many of our most important food-fishes, such as the common cod, pollack, haddock, etc. See **COD**; and **FISHERIES**.

GADOLIN, gä'dö-lén, JOHAN (1760-1852). A Swedish chemist. He was professor of chemistry at the University of Åbo, Finland. His writings include: *Einige Bemerkungen über die Natur des Phlogiston* (1788), and *Systema Fossilium, Analysisus Chemicis Examinatorum* (1825). The mineral *gadolinite* was named after him.

GADOLINITE (so called in honor of J. Gadolin). An orthosilicate containing glucinum, iron, yttrium, besides varying amounts of didymium, lanthanum, and other oxides. It crystallizes in the monoclinic system, and is dark green, brown, or black in color. This mineral occurs chiefly in coarse pegmatitic veins associated with allanite. It is found near Falun and Ytterby, Sweden, and also on the island of Hitterö, Norway. The principal locality in the United States is Bluffton, Llano County, Tex. Special interest attaches to gadolinite, owing to the rare metals which it contains. Velvety black, opaque gems have been cut from this mineral, but for collectors' use only.

GADOW, gä'dö, HANS FRIEDRICH (1855—). A German-English naturalist, born in Pomerania. He studied at Berlin, Jena, and Heidelberg. In the last place under Gegenbaur. From 1880 to 1882 he was in the Natural History Department of the British Museum, and since 1884 he has been Strickland curator and lecturer on zoölogy at Cambridge University, England. He has published: *A Classification of Vertebrates* (1898); "Aves," in Bronn's *Classen und Ordnungen des Thierreichs*; and *Amphibia and Reptiles* (1901), besides collaborating with Newton in his *Dictionary of Birds* (1893-96) and contributing extensively to the literature of investigation in zoölogy.

GADSBY, gädz'bi, HENRY ROBERT (1842—). A leading English composer, born at Hackney, London. At seven years of age he became a probationary chorister of Saint Paul's Cathedral, and served nine years in the choir. Although he studied for a little while under a local teacher, he was practically a self-taught musician. His first appointment was as organist of Saint Peter's Church, Brockley, and in 1884 he succeeded Sir John Hullah as professor of harmony at Queen's College, London. He was also on the faculty of the Guildhall School of Music. He is the author

of a standard text-book on harmony, and has published numerous cantatas, part songs, incidental music to plays, church services, anthems, songs, etc., as well as many important orchestral compositions.

GADSBYS, THE STORY OF THE. A story by Rudyard Kipling, published in London in 1890. It is written in dialogue form, and is a study of the effect of matrimony upon an English army officer in India, and the gradual enfeebling of his military ambition through responsibilities and affection for his family.

GADS'DEN. A town and the county-seat of Etowah County, Ala., about 60 miles northeast of Birmingham; on the Coosa River, and on the Chattanooga Southern, the Louisville and Nashville, the Southern, and other railroads (Map: Alabama, D 1). It is in a productive timber and mineral region, and has large trade interests; also lumber-mills, blast-furnaces, foundries, and machine-shops, car-works, and manufactures of handles, sash, doors, and blinds, flour, wagons, etc. Settled about 1845, Gadsden was incorporated in 1867. The government is administered under a charter of 1883, which provides for a mayor, chosen every two years, and a municipal council, elected on a general ticket. Population, in 1890, 2901; in 1900, 4282.

GADSDEN, CHRISTOPHER (1724-1805). An American patriot. He was born in Charleston, S. C., and was sent to England by his father, a wealthy merchant, to be educated. In 1741 he returned to Charleston. For some time he was employed in a counting-house in Philadelphia, where later he embarked in business on his own account. Returning to South Carolina, he was, in 1765, elected a delegate to the Intercolonial Convention held in New York City to protest against the Stamp Act. In 1774 he was a member of the first Continental Congress in Philadelphia. After the outbreak of the Revolution he was commissioned colonel, and took part in the campaigns in the South and in the defense of Charleston in 1776, being promoted brigadier-general in the fall of that year. In 1778 he was a member of the State Constitutional Convention of South Carolina. Elected Lieutenant-Governor of the State, he signed the capitulation of Charleston when that city fell into the hands of Sir Henry Clinton, in May, 1780. He himself was released on parole, but a few weeks later was arrested by order of Lord Cornwallis and conveyed to Fort Augustine, where he remained a prisoner for ten months, refusing to accept freedom on parole. He was finally exchanged, before the close of hostilities, in 1781. In 1782 he was elected Governor of South Carolina, but refused to accept the office, pleading that he was too old.

GADSDEN, JAMES (1788-1858). An American soldier and diplomatist, born in Charleston, S. C. He graduated at Yale in 1806, and entered the United States Army soon afterwards. He served with marked efficiency in the War of 1812, was appointed aide-de-camp to General Jackson in 1818, participated in the Seminole War, was appointed military inspector of the Southern Division in 1820, and subsequently conducted the removal of the Seminole Indians to the southern part of Florida. In 1853 he was sent to Mexico as United States Minister, and in December of that year concluded the treaty which provided

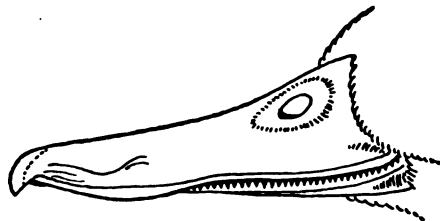
for the readjustment of the boundary between the two countries, and the acquisition by the United States of the tract of land subsequently known as the 'Gadsden Purchase' (q.v.).

GADSDEN PURCHASE, THE. A tract of land lying partly within the present New Mexico and partly within the present Arizona, purchased from Mexico by the United States in 1854. It embraces 45,535 square miles, is bounded on the north by the Gila River, on the east by the Rio Grande, and on the west by the Colorado, and has an extreme breadth from north to south of 120 miles. For this the United States gave the sum of \$10,000,000, while Mexico, besides making the cession, agreed (1) to the abrogation of the eleventh article of the Treaty of Guadalupe Hidalgo (q.v.), and (2) to the abandonment of all damage claims arising from Indian incursions between 1848 and 1853. The land was regarded as of little use for agricultural purposes, and was purchased largely with a view to settling boundary disputes in that quarter between the two governments and to securing a desirable route for the projected Southern Pacific Railroad. The treaty of sale was negotiated with Santa Anna by James Gadsden (q.v.), then Minister to Mexico, in December, 1853, and, after undergoing modifications in the United States Senate, was finally ratified and proclaimed on June 30, 1854, Congress passing the necessary legislation on August 5th. The sale met with much opposition in Mexico, and caused the banishment of Santa Anna in 1855. For the text of the treaty, consult Haswell, *Treaties and Conventions* (Washington, 1889). See the map in the article UNITED STATES, EXTENSION OF THE TERRITORY OF THE.

GADS'HILL. A hill, 256 feet high, in the county of Kent, England, 2½ miles northwest of Rochester, on the London Road, celebrated by Chaucer, famous as the scene of Falstaff's encounter with Prince Henry, and noted as the home of Charles Dickens.

GADSKI, gäd'ské (TAUSCHER), JOHANNA (1871—). A German prima donna, born at Anclam, Prussia. She was educated at Stettin, but made her operatic debut in New York, as Brünhilde, and subsequently appeared in many Wagnerian rôles. In England she sang at Worcester Festivals and at Covent Garden, meeting with the same success that characterized her extended American tour of 1898-99. In the latter year she also sang in Bayreuth.

GADWALL (of doubtful etymology; hardly from *gad*, to run about + *well*, as the variant



BILL OF GADWALL.

spelling *gadwell*, influenced by popular etymology, implies), or GRAY DUCK. A fresh-water duck (*Chauleasmus streperus*), not quite so large as

the mallard, nor often seen in the Eastern United States, but common in the interior and in Florida. It breeds from Kansas northward, and during the summer is circumpolar in its distribution. In the winter it migrates as far south as the Gulf of Mexico, Southern Asia, and the north of Africa. In color the gadwall is chiefly black and white, with some brown, buff, and chestnut. This duck breeds in marshes, and lays from seven to nine cream-white eggs. Except at the breeding season, it is usually seen in small flocks, and an individual is sometimes to be found in a flock of other ducks. It is a favorite game duck, and highly esteemed for the table.

GÆ'A (Lat., from Gk. *Γαῖα*, *Gaia*), or **GE**. The earth, honored among the Greeks as a goddess, though her personality is never very sharply defined. The theogonies of the mythologists, though differing in details, represent her as the first-born of Chaos, and by Uranus (q.v.) the mother of the Titans (q.v.), Cyclopes (q.v.), and the hundred-handed monsters. Angered at Uranus's treatment of his children, she helped Cronus mutilate his father. When Cronus in his turn was deposed by Zeus, Gæa, angry at the fate of her children, the Titans, produced the Giants, who warred against the gods, and, after their overthrow, the monster Typhoeus. When he was conquered by Zeus, Gæa became reconciled to the new dynasty. In accordance with the varying points of view from which the earth was regarded, we find Gæa revered not merely as the universal mother, but as a goddess of death and the shades, and as an oracular divinity, though *Ægæ*, in Achæa, seems to have been the only place where an oracle of Gæa existed in historic times. In art, Gæa appears chiefly in connection with the birth of Erichthonius (see **ERECITHEUS**) and the Gigantomachia; in both scenes she appears as rising out of the earth, only the upper part of the body being visible.

GAEDERTZ, géd'erts, **KARL THEODOR** (1855—). A German dialect poet and historian of literature. He was born at Lübeck, and was educated at Leipzig and Berlin. His extensive knowledge of cameralistics, law, philology, and of various other sciences, as well as his wide acquaintance with Germanic literature, secured for him an appointment, in 1891, as custodian of the Royal Library in Berlin, of which he became chief librarian in 1900. His publications include a number of valuable monographs on German poets and on the history of the German drama, among his best productions in this field being the following: *Goethes München* (2d ed. 1888); *Aus Fritz Reuters jungen und alten Tagen* (vol. i., 3d ed. 1899); *Emanuel Geibel. Ein deutsches Dichterleben* (1897); *Bismarck und Reuter* (1898); *Bei Goethe zu Gaste* (1900). His original productions in Plattdeutsch comprise a comedy, *Eine Komödie* (2d ed. 1881), and a collection of poems, *Julkapp! Leeder un Läschen* (3d ed. 1899).

GAEKWAR, gā'kwār (Marathi, herdsman), or **GUIKOWAR**, gē'kō-wār. The designation of the Mahratta ruler of Baroda (q.v.), one of the native States in India. The Gaekwar originally was an officer in the establishment of the rajahs of Satara, who were nominally the supreme rulers of the Mahrattas (q.v.). The Gaekwar finally became hereditary second in command of

the Mahratta armies. Pelaji, who became Gaekwar in 1721, by predatory excursions, gradually acquired authority over Gujarat, and his son, Damaji, who succeeded in 1732, still further extended the bounds of his ample dominions. The latter threw off his allegiance to the Peishwa; but, being taken prisoner by treachery, was compelled to yield one-half of his dominions and do homage for the other half. Annund Rao, who ascended the throne in 1800, was the first prince of the line who had intercourse with the British. The throne of the Gaekwar being contested by an illegitimate brother, Annund Rao secured the aid of the British Government at Bombay, and agreed by treaty, March 15, 1802, to receive a British subsidiary force. Suaji Rao, who became Gaekwar in 1819, was frequently on hostile terms with the British Government, and in 1838 part of his State was sequestered. In 1840 he made his submission, and, among other concessions, abolished suttee. His successor, Mulhar Rao, inherited the family vices, and in 1873 a commission inquired into his conduct. He was subsequently accused of attempting to poison the British Resident, and tried before a commission, which disagreed about his guilt; but he was deposed on account of his general misrule, and Gopal Rao, a prince of the Khandesh line, was appointed his successor.

GAELIC (gā'lik) **LANGUAGE AND LITERATURE**. See **CELTIC LANGUAGES**; **IRISH GAELIC LITERATURE**; **SCOTTISH GAELIC LITERATURE**.

GAELIC LEAGUE. An organization devoted to the preservation, cultivation, and extension of the Gaelic language, particularly in Ireland. From the time of the Statute of Kilkeny in 1367, when laws were enacted forbidding the use of the Irish language, dress, or surnames within the limits of the Pale, on penalty of death or confiscation, every effort had been made by the English Government to crush out or discourage the native language; and on the establishment of the so-called National Schools in 1833, the instruction in which was in the English language, the Gaelic language, even then spoken by a majority of the Irish peasantry, received its most decisive blow. Through the efforts of the 'Society for the Preservation of the Irish Language,' about twenty-five years ago, some partial concessions were obtained for the language in the schools, but with little practical result, owing to the indifference of the local authorities. Matters were apparently at their lowest mark in all things national when, in 1893, the Gaelic League was organized, chiefly through the effort of Douglas Hyde (q.v.) and Father O'Growney (q.v.), the two most accomplished Gaelic scholars in Ireland. An active educational campaign was at once begun throughout the country, resulting in the establishment of branches of the League in every important centre. In 1898 the movement spread to America. Gaelic is now taught in a large number of National schools, and in nearly all the Catholic Church parish schools in Ireland, the last report showing about 3500 students of Gaelic in Dublin alone. Trinity College, Dublin, and the Roman Catholic Seminary of Maynooth, maintain Gaelic chairs, and a revival in Gaelic literature has since developed, including a revival of Gaelic music and the drama. In the United States and Canada there were in 1902

about forty branches of the League, each of which conducted classes for the study of the language, besides rendering efficient help to the Irish organization. Gaelic or Celtic chairs are also established at Harvard University, the Catholic University of America, Washington, and at Notre Dame University, Indiana. Substantial aid has been rendered by the Hibernian Order, which endowed the Washington chair, and has regularly contributed to the work in Ireland. A similar movement has been inaugurated for Scotland and the Isle of Man by a Pan-Celtic organization which includes Wales, Brittany, and Cornwall in its scope of operations.

GAETA, gá-á'tá. A city and seaport, and one of the strongest fortresses in Italy, on the Gulf of Gaeta, 74 miles by a winding railway northwest of Naples (Map: Italy, H 6). The promontory of Gaeta, on which it is situated, looks from the distance like a tumulus, and according to tradition was the tomb of Caieta, the nurse of Æneas; hence the ancient name of the city, *Portus Caieta*. The promontory is crowned by the Torre d'Orlando, the tomb of Munatius Plancus, the friend of Augustus. It is 160 feet in height and 160 feet in diameter, and resembles the much smaller tomb of Cæcilia Metella at Rome. On the rocks below is the town in a beautiful setting of country houses and orange groves, while the Torre Angiovinina in the citadel affords a splendid prospect of coast and sea. Objects of antiquarian interest are the campanile of the Cathedral of Saint Erasmus, and the remains of a Roman amphitheatre and a Roman theatre. Gaeta is a centre of the coasting trade, and markets fish, oil, wine, and fruit. It was originally a Greek colony, and in ancient times was crowded with magnificent public buildings. Like Amalfi and Naples, it resisted the barbarian invaders, and becoming part of the Byzantine Empire—and later independent—was also a stronghold of civilization against the Lombards and Saracens. In 1134, however, it fell before Roger II., and was annexed to the Norman Kingdom of Sicily. During the centuries that followed it was the sport of various masters, and in 1808 was gloriously defended for six months against Masséna by Prince Ludwig von Hessen-Philippsthal, who is buried in the citadel. It was the refuge of Pius IX. (q.v.) from 1848, when he fled from Rome, until 1850. From November, 1860, until February 13, 1861, Francis II. of Naples, the last of the Bourbon kings, was besieged here by the forces of Victor Emmanuel, and compelled to surrender. Population, in 1881, 6429; in 1901, 5528.

GÆTULIA (Lat., from Gk. Γαιουλλία, *Gaitoulia*). In ancient times, the name given to a region in Northern Africa lying south of Mauritania and Numidia, and embracing the western part of the Desert of Sahara. Its inhabitants belonged to the great aboriginal Berber family of North and Northwestern Africa. They were not in general black, though a portion of them dwelling in the extreme south toward the Niger had approximated to this color through intermixture with the natives and climatic causes. The Gætulians were savage and warlike. They came into collision with the Romans for the first time during the Jugurthine War, when they served as light horse in the army of the Numidian King. Cornelius Cossus Lentulus led a force

against them, and for his success received a triumph and the surname of Gætulicus (A.D. 6). They have been identified with the Tuaregs, the Gutzula of Southern Morocco, the Godola of the Coast, the Ghedala of Northwestern Sudan, and the Gæstulas in Algeria.

GAFF (from OF. *gaffe*, hook, from Ir. *gaf*, hook). A spar, to which the head, or upper edge, of a fore and aft sail is bent. The end next the mast is called the *jaws*; to form them two pieces of wood are bolted to the end of the gaff and the forward side of them cut out in the form of a semicircle so as to fit against the mast, to which it is held by a rope extending around it from jaw to jaw. The after end of the gaff is called the *peak*, because it usually stands much higher than the jaws when the sail is set. On board sloops and schooners gaffs are hoisted and lowered by ropes called *halyards*—those near the peak being the *peak-halyards*, and those at the *throat*, near the jaws, being the *throat-halyards*. In square-rigged ships, the *spanker* and *trysails* are the only ones having gaffs. These gaffs do not ordinarily hoist or lower, and, instead of jaws, have eyebolts holding the forward end to the mast or to a traveler working on a batten on the mast; the latter method is best, as it permits the gaff to be lowered when the sail is reefed. In furling, these sails are drawn in to the mast and up to the gaff by ropes called *brails*.

GAFFAREL, gá'fá'rél', PAUL LOUIS JACQUES (1843—). A French historian, born at Moulins, and educated at the Superior Normal School. He held the chair of history at Besançon, and afterwards became professor of history and geography and dean in the faculty of letters at Dijon. His contributions to colonial history are particularly valuable. His more important works include: *Etude sur les rapports de l'Amérique et de l'ancien continent avant Christophe Colomb* (1869); *Les colonies françaises* (1880); *L'Algérie: histoire, conquête et colonisation* (1882); *Les explorations françaises de 1870 à 1881* (1882); *Les campagnes de la première République* (1883); *La conquête de l'Algérie jusqu'à la prise de Constantine* (1887); *Les Français au delà des mers: Les découvreurs français du XIVème au XVIème siècle; Côtes de Guinée, du Brésil et de l'Amérique du Nord* (1888); *Campagnes du Consulat et de l'Empire* (1888); *Campagnes du premier Empire* (1890); and *Le Sénégal et le Soudan français* (1890).

GAFFKY, gáf'kè, GEORG THEODOR AUGUST (1850—). A German physician, born at Hanover and educated at Berlin. In 1888 he was appointed professor of hygiene at the University of Geissen. As a member of the Imperial Bureau of Sanitation in 1883-84 he accompanied the expedition sent out, under the auspices of Robert Koch, the celebrated bacteriologist, to investigate the conditions attending the epidemics of cholera in Egypt and India. In this capacity he was enabled to accumulate the valuable material embodied in the report subsequently published in collaboration with Dr. Koch, and entitled *Bericht über die Thätigkeit der zur Erforschung der Cholera 1883 nach Aegypten und Indien entsandten Kommission* (1887). His other publications include: *Experimentell erzeugte Septicæmie* (1881); *Zur Aetiologie des Abdominaltyphus* (1884). These and other important treatises by Gaffky have appeared principally in the

Mitteilungen issued by the Imperial Bureau of Public Sanitation.

GAFF-TOPSAIL CAT. A sea catfish (*Felichthys marinus*), common along the eastern coast of the United States and frequently ascending streams. It reaches a length of 30 inches, is not valued as food, and takes its name from the shape of its large dorsal fin, frequently exposed above the surface. See *PLATE OF CATFISH*.

GAG (corrupted from the Spanish name *aguaji*). A large grouper (*Mycteroperca microlepis*), of a variable bluish color, of the South Atlantic and Gulf coast of the United States, called by Spanish fishermen 'aguaji.' It frequents reefs and banks, reaches a weight of 50 pounds, and is an important food-fish. See *GROUPEE*.

GAGALI. See *PODOCARPUS*.

GAGARIN, gá-gá-rén. A princely family of Russia. Some of its most prominent members were Matvei Petrovitch, Governor of Siberia, who suffered death in 1721 by order of Peter the Great on suspicion of aspiring to an independent sovereignty. Alexander Ivanovitch (died 1857) was a distinguished soldier of the Crimean War, and was assassinated by the Prince of Suanethi, whose province he was about to annex to Russia. Pavel Pavlovitch (1789-1872) was a member of the council of emancipation of the serfs, and in 1864 and 1865 president of the Council of Ministers. Ivan Sergejevitch (1814-82) was secretary to the Russian Embassy at Paris, turned Catholic in 1843, and became a Jesuit missionary. He was the author of many ecclesiastical books and pamphlets, among them *Les starovères*, *l'église russe et le pape* (1857); *Les hymnes de l'église russe* (1868).

GAGE (Fr. *gager*, from Lat. *vadium*, a pawn or pledge). An old term of English law, signifying a pledge or pawn of property as security for the performance of a legal obligation. It has lost its independent position in our legal system, and is now found only in the combination mortgage (*mort gage*, dead pledge).

Estates in gage were of two kinds—*vivum vadium*, and *mortuum vadium*, the live pledge and the dead pledge. *Vivum vadium* was where an estate in lands was given in security for a debt, on condition that the estate should remain with the lender until he had made good the sum lent out of the profits of the land. *Mortuum vadium* was a pledge of land or goods to be held by the pledgee until the debt be paid or the obligation performed by the pledgor. See *MORTGAGE*; *PLEDGE*.

GAGE, FRANCES DANA BARKER (1808-84). An American reformer and writer, the daughter of Col. Joseph Barker. She was born in Marietta, Ohio, and early distinguished herself by lecturing on total abstinence, woman's rights, and anti-slavery. She removed to Saint Louis in 1853, and suffered the usual persecutions to which all prominent abolitionists were subjected. Returning to Ohio, she devoted herself largely to editorial work. During the Civil War she gave her services in caring for the sick and wounded. Under the pen-name of 'Aunt Fanny,' she became widely known as a writer of stories for the young.

GAGE, LYMAN JUDSON (1836—). An American financier. He was born in De Ruyter, Madison County, N. Y., and was educated at an

academy at Rome, N. Y., where in 1859 he became a clerk in a bank. In the following year he removed to Chicago, where, after working for three years in various capacities, he obtained a clerkship in the Merchants' Loan and Trust Company, of which in 1860 he became cashier. In 1868 he left this position to become assistant cashier of the First National Bank, one of the leading banks in the West. In 1882 he was promoted to the position of vice-president and general manager, and in 1891 became its president. In 1892 he first became a figure of national prominence from his election as president of the board of directors of the World's Columbian Exposition, the success of which was probably due more to him than to any other one man. He had never taken an active part in politics or held political office, although he had been a delegate to the Republican National Convention of 1880, and the chairman of its committee on finance, but he actively supported Cleveland in the campaign of 1884. In 1892 the Treasury portfolio was offered him by President Cleveland, but declined. In 1897 he was appointed by President McKinley Secretary of the Treasury, which office he continued to hold in McKinley's second administration, and in that of President Roosevelt up to January, 1902, when he resigned and was succeeded by Leslie M. Shaw. Consult *Handy*, "Lyman J. Gage: A Character Sketch," in the *American Review of Reviews* (New York, 1897).

GAGE, SIMON HENRY (1851—). An American scientist, born in Maryland, Otsego County, N. Y. He graduated in 1877 at Cornell University, and was appointed associate professor of physiology there in 1889. In addition to many contributions to scientific periodicals, his publications include: *The Microscope and Histology* (1881, 4th ed. 1892); *Anatomical Technology* (with Professor Wilder, 1882); the vocabulary and definitions in animal histology for Foster's *Encyclopædic Medical Dictionary*, and several articles for Wood's *Reference Handbook on the Medical Sciences*.

GAGE, THOMAS (1721-87). An English soldier and Colonial Governor of Massachusetts, born at Firle, Sussex. He received a lieutenant's commission in the English Army in January, 1741, participated in the battle of Culloden, served as aide-de-camp to Lord Albemarle in Flanders, and in 1751 became lieutenant-colonel of the Forty-fourth Foot, with which in 1754 he came to America under General Braddock. In the latter part of the march against Fort Duquesne, he commanded the advance guard of Braddock's army. Subsequently he was stationed for a time at Oswego, raised a regiment of Provincial troops in 1758, and commanded it on Abercromby's disastrous expedition against Ticonderoga; and in 1759, after the death of Colonel Prideaux, was sent as brigadier-general to replace Sir William Johnson at Niagara. He then served in the last campaign under General Amherst, was made Governor of Montreal in 1760, was promoted to be major-general in 1761, and was commander-in-chief of the English forces in America from 1763 to 1772, when he returned to England. In 1765, while stationed at New York, he was called upon by Governor Colden to enforce the Stamp Act (q.v.), but refused on the ground that a fire from the fort would be 'the commencement of a civil war.' Three years later he was ordered to Boston

to assist the civil magistrates and revenue officers there in carrying out the measures of the British Ministry. Early in 1774 he succeeded Hutchinson as Governor of Massachusetts, and again became commander-in-chief of the British Army in America. He was warmly welcomed on his arrival in Boston in May, but soon antagonized the popular party by his enforcement of the Ministerial measures, especially of the Boston Port Bill (q.v.) and the regulation acts. On June 30, 1774, he issued a proclamation against the 'solemn league and covenant' not to purchase articles imported from Great Britain. On September 1st he seized the powder stored at Cambridge, and soon afterwards began to fortify Boston. On the night of April 18, 1775, he sent an expedition to Concord to destroy the Provincial stores there and to capture Samuel Adams and John Hancock. This led to the battle of Lexington on the following day. (See LEXINGTON.) He ordered the assault upon Bunker (Breed's) Hill on June 17th, and as soon as the news of the action reached England was recalled, sailing from Boston on October 10, 1775. In April, 1782, he was promoted to the rank of general.

GAGERN, gá'gèrn, HEINRICH WILHELM AUGUST, Baron von (1799-1880). A German statesman. He was the second son of the well-known politician Hans Christopher Gagern (1766-1852), and was born at Bayreuth, August 20, 1799. He was educated at the military school of Munich, and on Napoleon's return from Elba entered the army of Nassau, serving as lieutenant at Waterloo. He afterwards devoted himself to the study of law at the universities of Heidelberg, Göttingen, Jena, and Geneva. While at Heidelberg he aided in founding the liberal society of the Burschenschaft (q.v.). On returning home in 1821, he entered political life, and after passing through several public offices, in the Grand Duchy of Hesse, he was elected a member of the Lower Chamber in 1832, in which position he vigorously opposed the reactionary policy of the State governments and of the Federal Diet. In 1836 he retired to his father's estates, but reappeared ten years later and helped bring on the revolutionary movement of 1848 in Germany. In common with some of the greatest men of the time Gagern cherished the hope of a new Germany, organized upon a constitutional basis and under the leadership of a powerful prince who should win for the nation a place among the Powers of Europe. In the National Assembly which met at Frankfurt on May 18, 1848, Gagern, as the recognized leader of those who favored unity and constitutionalism, was elected president, and for a long time succeeded, by the force of his enthusiasm and his magnificent personality, in guiding the action of the Assembly. In the strife over the question of admitting Austria as a Germanic power into the new Empire, Gagern sided with those who opposed Austrian pretensions, and on December 18, 1848, as head of the Imperial Ministry, submitted his 'programme' to the Parliament providing for a Federal State without Austria. Though the plan was accepted by the Parliament, it failed on account of the lukewarmness of the Prussian King, to whom all looked as the head of the new State, and the general reaction which followed in Germany during the early days of 1849. On May 20th Gagern withdrew from the Parliament, convinced that the cause of German

unity, for the time, was a hopeless one. He still took an active interest in politics, however, and in 1850-52 served as a major in the army of the duchies of Schleswig-Holstein. On the conclusion of the struggle he retired to his estate at Monheim, and only reappeared as the representative of the Grand Duchy of Hesse-Darmstadt at Vienna from 1864 to 1872. He was granted a pension in 1872 and took up his residence at Darmstadt, where he died May 22, 1880. Besides several pamphlets and speeches, he was the author of a life of his brother, *Das Leben des Generals Friedrich von Gagern* (1856-57). His younger brother Maximilian was prominent in the service of the Duchy of Nassau and of Austria. Consult: Heimenz, *Heinrich von Gagern in seinen politischen Grundanschauungen* (Tübingen, 1899); Biedermann, *Deutsche Geschichte, 1815-79* (Breslau, 1883-89); von Sybel, *The Founding of the German Empire*, translated (New York, 1890-98).

GAGNON, gá'nyón', LUCIAN (?-1842). A Canadian political agitator, born at Pointe-à-la-Mule, Canada. He was a member of the Assembly of the Counties at Saint Charles, October 23, 1837, and subsequently carried on a campaign of agitation against British rule. He was instrumental in mustering a force of rebels, who were defeated at Moore's Corner and compelled to take refuge in the United States. Another attempt at insurrection also proved unsuccessful, and Gagnon was arrested by United States troops on the charge of having violated the neutrality laws. After the engagement at Odelltown, November 10, 1838, he gave up the struggle and settled in the United States.

GAG RULES. In American history, the name applied to certain rules passed by the National Congress in disregard of the First Amendment to the Federal Constitution, for the abridgment of the right of petition with reference to the abolition or restriction of slavery. After the beginning of the earnest agitation of the Northern abolitionists against the institution of slavery about 1831, petitions of various kinds poured into the House and the Senate, praying for the abolition or the restriction of that institution. These were generally presented by John Quincy Adams, who as a member of Congress identified himself particularly with the struggle against any Congressional abridgment of the right of petition. In May, 1835, the House passed the so-called 'Pinckney Resolutions,' substantially renewed in January, 1837, which provided that all petitions relating to slavery should virtually be disregarded, should not be printed or referred, and should be laid on the table without action. The resolutions also asserted that Congress should not interfere with slavery in the District of Columbia, and that that body had no power, according to the Constitution, to take action with regard to slavery in the individual States. Adams's attempts to introduce petitions in disregard of these resolutions provoked animated debates, in which, on some occasions, considerable feeling was aroused between Northern and Southern members. In December, 1837, the House passed the so-called 'Patton Resolutions,' introduced by J. M. Patton, of Virginia, which declared against the reading, referring, debating, or printing of any petition praying for the interference of the National Government with the

institution of slavery in any part of the United States, including the Territories and the District of Columbia. In December of the following year the House passed the so-called 'Atherton Gag,' covering much the same ground as the 'Patton Resolutions,' and in January, 1840, passed the famous Twenty-first Rule to the same general effect. Adams continued to offer petitions, however, and at the opening of each new Congress endeavored to have the objectionable rule omitted. The majority against him progressively decreased, and in December, 1844, the rule was rescinded. Consult: Adams's *Memoirs* (12 vols., Philadelphia, 1874-77); Benton's *Abridgment of the Debates of Congress, 1789-1856* (16 vols., New York, 1857-61); id., *Thirty Years' View* (2 vols., New York, 1854-56); and Wilson, *Rise and Fall of the Slave Power in America*, vol. i. (3 vols., Boston, 1872-77).

GAGUIN, gā'gān', ROBERT (c.1425-1502). A French chronicler and diplomat, born at Calonne-sur-la-Lys. He studied at the University of Paris under Fichet, and was made professor of canon law there (1463) and dean of the faculty. He was intrusted with various diplomatic missions by Louis XI. and Charles VIII., and traveled in Germany, Italy, England, and Spain. He is said to have had the care of the libraries of both these kings. His Chronicle went through many editions under the title *Compendium super Origine et Gestis Francorum a Pharamundo usque ad Annum 1491* (1497). He also left some letters and discoveries, *Epistolæ et Orationes* (1498).

GA'HERIS. The Orestes of Arthurian legend. He was the son of Arthur's sister, Morgause. He found his mother in adultery with Sir Lamahake and cut off her head.

GAIDOZ, gā'dōz', HENRI (1842-). A French scholar, born in Paris. He has published many learned articles in scientific periodicals on archaeology and mythology, and is the author of a number of books on the same subjects, notably *Equisse de la religion des Gaulois* (1879); *La religion gauloise et le gui de chêne* (1881); *Les religions de la Grande Bretagne* (1885); *Le blason populaire de la France* (with Sébillot, 1884); *Bibliographie des traditions et de la littérature des Francs d'outre mer* (with Sébillot, 1886); *Etude de la mythologie gauloise* (1886); and *Les Roumains en Hongrie* (1894). He founded the *Revue Celtique* in 1870, and in 1877 was associated with Eugène Rolland in the establishment of *La Mélusine* for the study of folklore.

GAITY THEATRE, THE. A London theatre situated on the Strand, and opened in 1868. It is the original home in England of opera bouffe.

GAIL, gāl, JEAN FRANÇOIS (1795-1845). A French Hellenist, son of Jean Baptiste Gail (1755-1829). He was born in Paris, and in 1829 became a professor at the Military Academy of Saint Cyr. His chief works were: *Recherches sur la nature du culte de Bacchus en Grèce* (1821); and the *Geographi Græci Minores* (1826-31), containing, besides other extracts, the *Periplus* of Hanno, that of Scylax, and fragments of Scymnos.

GAIL, gāl, WILHELM (1804-90). A German architectural and landscape painter, born in Munich, where he studied at the Academy and under

Peter Hess, his brother-in-law. After traveling in Italy (1825-27), France (1830), and Spain (1832), he settled in his native city. His paintings in public galleries include: "Hall in Doge's Palace," "San Lazzaro in Venice" (1832), and "Sanctuary of Mosque at Cordova" (1836), in the New Pinakothek, Munich; "Interior of Cloister" and "Spanish Cloister with Procession of Monks," in the Kunsthalle at Karlsruhe; and "Convent of San Martino in Piedmont" (1857), in the National Gallery, Berlin.

GAIL HAMILTON. See DODGE, MARY A.

GAILLARD, gā'yār', CLAUDE FERDINAND (1834-87). A French engraver, born in Paris. He was a pupil of Léon Cogniet, and took the Prix de Rome for engraving in 1856. Among his most remarkable plates are those after Van Eyck, Botticelli, Donatello, Michelangelo, Raphael, and Rembrandt. He also engraved from his own designs portraits of the Count de Chambord, Pius IX., Leo XIII., Monseigneur Pie, and Sœur Rosalie. There are two portraits by him in the Luxembourg, "Monseigneur de Ségur" and an old woman. These especially show his particular faculty, an almost clairvoyant grasp of personality.

GAILLARD, EDWIN SAMUEL (1827-85). An American physician. He was born in Charleston District, S. C., graduated at the University of South Carolina in 1845, and at the State Medical College in 1854. During the Civil War he served in the Confederate Army, holding various positions in the medical department, and subsequently was editor, successively, of the *Richmond and Louisville Medical Journal* and of the *American Medical Weekly*.

GAILLARD, gā'yār', GABRIEL HENRI (1726-1806). A French historian and academician. He was born at Ostel, near Soissons; took up the study of law, but abandoned his legal pursuits for history, and published a large number of works, characterized more by elegance of style than by strict adherence to facts. Among these are: *Histoire de Marie de Bourgogne* (1757); *Histoire de François I.* (1766-69); *Histoire de la rivalité de la France et de l'Angleterre* (1771-77); *Histoire de Charlemagne* (1782). Gaillard also wrote *Eloges* on Descartes, Corneille, Molière, Charles V., Henry IV., and his intimate friend, Mallesherbes.

GAILLARDET, gā'yār'dā', THÉODORE FRÉDÉRIC (1808-82). A French dramatist and author, born at Auxerre. He achieved much notoriety through his duel with Alexandre Dumas, père, and his subsequent lawsuit over the rights to the play *La tour de Nesle*, which Dumas had placed upon the stage as his own (1832). He wrote two other dramas, *Struensee, ou le médecin de la reine* (1832), and *Georges, ou le criminel par amour* (1833), and also *Mémoires du chevalier d'Eon* (1836). While in America he founded in New York City (1827) the *Courrier des Etats-Unis*, which he directed until 1848.

GAINAS (died 401). A Visigoth, commander-in-chief of the Roman Army. He was an Arian, and caused the downfall and execution of the eunuch Eutropius. He used his position for treasonable purposes, which he cloaked successfully for some years. At length he became openly hostile, and attempted to seize Constantinople. His attempt was foiled and his army of Goths destroyed. He fled, but was captured by the

King of the Huns, who sent his head to Constantinople. Consult Bury, *History of the Later Roman Empire*, vol. i. (London, 1889).

GAINES, EDMUND PENDLETON (1777-1849). An American soldier. He was born in Culpeper County, Va., but was early taken by his father to North Carolina. He studied law for a time, but in 1799 entered the United States Army as an ensign, and from 1801 to 1803 was employed in the making of a topographical survey from Nashville to Natchez for the location of a military road. In 1802 he became a first lieutenant, and two years later was appointed military collector of customs for the district of Mobile, in which capacity he arrested Aaron Burr (q.v.) on February 19, 1807. In the War of 1812 he served as captain in the battle of the Thames, participated in the engagement at Chrystler's Field, was commander at Fort Erie (q.v.) in August, 1814, until wounded by the bursting of a shell, and gradually rose to the regular rank of brigadier-general and the brevet rank of major-general. He was one of the commissioners appointed in 1816 to treat with the Creek Indians; was in command of the Southern Military District at the outbreak of the first Seminole War in 1817; was retained as brigadier-general and placed in command of the Western District when the army was reduced in 1821; took an active part in the second Seminole War of 1837, being severely wounded at Outhlacoohie; and at the outbreak of the Mexican War was in command of the Department of the Southwest, with headquarters at New Orleans, in which capacity he was actively engaged in raising volunteers for the army.

GAINES, JOHN P. (1795-1858). An American soldier and legislator, the third Territorial Governor of Oregon. He was born at Augusta, Va. (now West Virginia), but when very young removed to Boone County, Ky. He served as a volunteer in the War of 1812, subsequently was a member for several years of the Kentucky Legislature, and in the Mexican War served first as a major of Kentucky volunteers and afterwards as an aide to General Scott. He was then, from 1847 to 1849, a Whig member of Congress, and from 1850 to 1853, on President Fillmore's appointment, was Governor of the Territory of Oregon, in which capacity he came into serious conflict with the Territorial Legislature, notably over the location of the capital.

GAINES'S MILL, BATTLE OF. A battle fought on June 27, 1862, during the Civil War, between a Federal force of about 30,000 under General Fitz John Porter and a Confederate force of about 65,000 under General Lee, on the left or north bank of the Chickahominy River, eight miles northeast of Richmond, Va. It was the second of the famous Seven Days' Battles (q.v.) which marked the close of McClellan's Peninsular campaign. On the 27th of June, General Lee, having crossed the Chickahominy with the greater part of the army of Northern Virginia, attacked Porter's position at 2 p.m., the Confederate right, centre, and left being commanded by Longstreet, A. P. Hill, and Jackson respectively. Porter, though inadequately reinforced by McClellan, offered a magnificent resistance, and stubbornly held his position in face of repeated assaults until 7 p.m., when his left centre at

last gave way, and compelled a reformation at some distance to the rear of the whole line, under cover of two fresh brigades from the left wing, commanded by French and Meagher. The main battle had been preceded by a sharp contest between the Confederate A. P. Hill, advancing from Mechanicsville, and the Ninth Massachusetts Volunteers at Gaines's Mill, slightly in advance of the main Federal position, and from this the whole battle takes its name. During the night of the 27th Porter joined the left wing south of the Chickahominy, and McClellan, compelled to abandon his old base at White House on the Pamunkey River, hastily made arrangements to transfer his army to the James. During the progress of the battle McClellan, with the left wing, numbering fully 55,000 men, had been held in check by 25,000 Confederates under Magruder, and had been deceived into believing that a Confederate army, numbering over 100,000, lay between him and Richmond. Had he known the real state of affairs it seems probable that he could easily have overwhelmed Magruder and captured the city while Lee was occupied north of the river. On the other hand, Porter's stubborn resistance gave Lee an erroneous impression of the Federal strength at this point. The total Federal loss in the battle of Gaines's Mill was 6387 men, besides 22 guns; while the Confederate loss, though never accurately determined, was probably as much as 1000 more. Two years later the battle of Cold Harbor (q.v.) was fought in this vicinity. Consult: *Official Records*, vol. xi. (Washington, 1885); Johnson and Buel (editors), *The Battles and Leaders of the Civil War*, vol. ii. (New York, 1887); Ropes, *The Story of the Civil War*, vol. ii. (New York, 1894-98); Webb, *The Peninsula* (New York, 1881); and Nicolay and Hay, *Abraham Lincoln: A History*, vol. v. (New York, 1890).

GAINESVILLE. A city and the county-seat of Alachua County, Fla., 57 miles northeast of Cedar Keys; on the Plant System and the Florida Central and Peninsular Railroad (Map: Florida, F 2). It is a popular winter resort, and has the East Florida Seminary. In the vicinity are several points of natural interest, notably Alachua Sink, which alternately is prairie and lake. The principal industries are farming and orange-growing. Population, in 1890, 2790; in 1900, 3633.

GAINESVILLE. A city and the county-seat of Hall County, Ga., 52 miles northeast of Atlanta; on the Southern Railway (Map: Georgia, C 1). It is an attractive health resort, having several mineral springs, and is the seat of Brenau College and Conservatory of Music for young ladies, founded in 1878. There is a public park. The manufactures include cotton goods, cotton yarns, cottonseed oil, shoes, buggies, wagons, brick, lime, leather, tombstones, doors, sash, blinds, meal, and flour. Settled in 1821, Gainesville was incorporated in 1870. It is governed, under a revised charter of 1885, by a mayor elected every two years, and a council. The city owns and operates the water-works and electric-light plant. Population, in 1890, 3202; in 1900, 4382.

GAINESVILLE. A city and the county-seat of Cooke County, Tex., 65 miles north of Fort Worth; on the Missouri, Kansas and Texas, and

the Gulf, Colorado and Santa Fé railroads (Map: Texas, F 3). It is the centre of an agricultural and stock-raising district, and has packing houses and manufactures of cottonseed oil, flour and foodstuffs, pressed brick, etc. Gainesville was settled in 1851, incorporated in 1873, and is governed under a charter of 1879, which provides for a mayor, chosen biennially, and a municipal council, elected on a general ticket. Population, in 1890, 6594; in 1900, 7874.

GAINSBOROUGH. An ancient market-town and port on the Trent, in Lincolnshire, England, 16 miles northwest of Lincoln (Map: England, F 3). It is at the junction of the Great Northern, Great Eastern, and Midland, South and London railways. It was constituted a port in 1841, the canals connecting with the Trent making Gainsborough the eastern outlet for the Midland counties. It has important manufactures of linseed oil, ropes, malt, and tobacco, engineering and ship-building works. The town consists mainly of one long street running parallel with the river, which is spanned here by a fine stone bridge. The Old Hall, or Manor House, restored in 1884, a baronial residence with a tower 75 feet high, is said to have been built by John of Gaunt, and is now used as a corn exchange and assembly rooms. The John Robinson (1575-1625) Memorial Church, inaugurated in 1897, is dedicated to the pastor of the Pilgrim Fathers at Leyden, a reputed native of Gainsborough. The town owns its water-supply and maintains markets. Population, in 1891, 14,000; in 1901, 17,100. Consult Stark, *History of Gainsborough* (London, 1843).

GAINSBOROUGH, THOMAS (1727-88). An English portrait and landscape painter, born at Sudbury, in Suffolk. He was the youngest of nine children, and self-supporting at eighteen years of age. His parents sent him to London, at the age of fifteen, to study painting; he stayed with a goldsmith who introduced him to Gravelot, an engraver, from whom he gained his chief instruction. Later he was associated for three years with Frank Hayman, an historical painter of some reputation. After an unsuccessful attempt to have a studio in London, he returned to Sudbury in 1745, and continued his landscape studies. Soon after his return he married, and six months afterwards went to Ipswich, where for fifteen years he lived quietly and worked earnestly. In 1759 he sent eighteen of his pictures to the exhibition of the Society of Arts; in 1760 he removed to Bath, remaining until 1774, when he returned to London. In 1768 he was elected one of the original members of the Royal Academy. His stay at Bath was marked by success, and he painted many portraits of fashionable beauties and the brightest spirits of the day. George III., on hearing of Gainsborough's return to London, invited him to court, and gave him orders for portraits of himself and Queen. This seemed a signal for the fashionable world, which resulted in prosperity which lasted until Gainsborough's death. He died in London, August 2, 1788, and was buried at his request in Kew Churchyard, without name or inscription on the stone that marked his grave. Gainsborough painted that which charmed him in nature; he was the first impressionist in landscape art, somewhat like Corot, interpreting her poetic

qualities. The "Watering Place," painted between 1768 and 1775, is considered one of his best landscapes.

Gainsborough's portraits are distinguished for their noble and refined grace; they express almost invariably the moment of unconscious rest. They interpret the winning personality of the individual rather than such intellectual qualities as those suggested by Reynolds. Often faulty in drawing, the artist charms us by his color, which is cool, fresh, and transparent; the tones seem to follow each other like the chords of an instrument, without the slightest intimation of separation, always fading away into a background of dreamy atmosphere. His canvas was thinly painted with a smooth and swift technique.

The "Boy Blue," considered his greatest work, was the portrait of a son of Jonathan Buttall, a wealthy ironmonger of London. There are three existing versions of the same subject: one in the collection of the Duke of Devonshire, supposed to be the original; one owned by Mr. George Hearn, of New York; and a third, owned by Count de Castellane. The portrait of Mrs. Siddons, the actress, was painted in 1784, when she was at the height of her fame and but twenty-nine. It is a conception of her beauty distinctly opposed to Reynolds's portrait of the same time, known as the "Tragic Muse." Of Gainsborough's 300 paintings, 220 are portraits; there are also a few etchings and a collection of his drawings in the British Museum. The most important paintings comprise, besides those already mentioned: "Rustic Children"; "Portrait of Örpin, Parish Clerk of Bradford, Wilts"; landscape, "Gainsborough Forest," all in the National Gallery, London. In Buckingham Palace, "Duke and Duchess of Cumberland." In Stratford-on-Avon Museum, "David Garrick." In Windsor Castle, "George III., full length, and a portrait of the "Royal Family." At Dulwich, "Mrs. Moody and Her Children," "Mrs. Sheridan," and "Miss Tichell." In the National Portrait Gallery are several portraits. A number of important works by Gainsborough are in the United States. The Chicago Art Institute has one, a "Landscape with Figures." In the New York Metropolitan Museum are two "Landscapes," "Mr. Burroughs," and a "Child with Cat." In the collection of J. Pierpont Morgan is the "Duchess of Devonshire."

The portrait of the Duchess of Devonshire, known as the "Lost Duchess," was exhibited in 1793, and although a good example of the artist's work, it is more famous for its history than for its value as a work of art. It was bought by the art dealers Thomas Agnew and Sons, of London, for £10,065—the highest sum ever paid at a London art sale for a portrait. The canvas was cut from the frame in their galleries by a thief, and all efforts to recover it proved unavailing, until in April, 1901, it was turned over by the parties holding it to the Pinkerton detective agency in Chicago. Mr. Agnew came to America to identify the picture, which was afterwards sold by his firm to J. Pierpont Morgan, in whose collection it now remains.

For Gainsborough biography, consult: Fulcher (London, 1856); Brock-Arnold (ib., 1881), and Bell (ib., 1897); also Ruskin, *Modern Painters* (ib., 1873); Colvin, in *Portfolio* (ib., 1872); Wedmore, *Studies in English Art*, 1st series (ib.,



• **GAINSBOROUGH**

"THE BLUE BOY," FROM THE ORIGINAL IN THE GROSVENOR GALLERY, LONDON

1878); and Armstrong, *Gainsborough and His Place in English Art* (ib., 1898).

GAIRDNER, JAMES (1828—). An English historical writer and editor. He was born and educated at Edinburgh, and in 1846 was appointed a clerk in the Public Record Office. As his peculiar adaptability for the work became evident he was rapidly promoted, and he was made assistant keeper of the public records in 1859. He edited *Memorials of Henry VII.* (Rolls Series, 1858); *Letters and Papers Illustrative of the Reigns of Richard III. and Henry VII.* (Rolls Series, 1861-63); *Historical Collections of a London Citizen* (Camden Society Publications, 1876); *Letters and Papers of Henry VIII.* (Rolls Series, vols. v. to xv. in continuation of the work of Professor Brewer, 1880-96); *Three English Chronicles* (1880); and *The Paston Letters* (Arber reprints, 3 vols., 1872-75). In addition to numerous contributions to the *Dictionary of National Biography*, he published *The Houses of Lancaster and York* (Epoch Series, 1874); *Life and Reign of Richard III.* (1878); "Henry VII." (*Twelve English Statesmen*, 1889), and *Studies in English History*, with James Spedding (1881).

GAIRDNER, WILLIAM (1793-1867). A Scotch physician. He was born at Mount Charles, Ayrshire, graduated at the University of Edinburgh in 1813, and in 1822 settled in London, where he practiced his profession almost continuously until his death. He published an *Essay on the Effects of Iodine on the Human Constitution* (1834), and an excellent treatise *On Gout: Its History, Its Causes, and Its Cure* (1849).

GAIRDNER, Sir WILLIAM TENNANT (1824—). An English physician, born and educated at Edinburgh. In 1862 he was appointed professor of medicine at the university in that city. He took an active interest in securing reforms in municipal sanitation; and the enactment of the Glasgow Improvement Act in 1867 was due chiefly to his initiative. His publications include: *On the Pathology of Bronchitis, and the Diseases Connected with Bronchial Obstruction* (1850); *Clinical Medicine, Observations Recorded at the Bedside*, with Commentaries (1862); *On the Function of Articulate Speech, and Its Connection with the Hand and the Bodily Organs* (1866); *The Physician as Naturalist* (with Dr. Coats, 1889).

GAIS, gis. A neat Swiss village in the midst of green meadows, in the Canton of Appenzell. It has been in vogue as a 'whey resort' since 1749.

GAISFORD, THOMAS (1779-1855). A distinguished English scholar, born at Ilford. After studying at Christ Church, Oxford, he was appointed regius professor of Greek at the university (1812) and Dean of Christ Church (1831). From 1815 to 1847 he was rector of the parish of Westwell. In addition to his elaborate edition of the *Enchiridion* of Hephæstion (1810), with which he first won recognition as a critic, the most valuable of his classical publications include an edition of the *Poetæ Græci Minores* (1814-20), of Stobæus (1822), of Herodotus (1824), of Sophocles (1826), of the lexicon of Suidas (Oxford, 1834), of the *Paræmigraphi Græci* (1838), of the *Scriptores Latini*

Rei Metricæ (1837), of the *Etymologicum Magnum* (1844), and of Eusebius (1842-52).

GAISSIN, gi'sin. The capital of a district in the Russian Government of Podolia, situated on the Sobi, a tributary of the Bug, 180 miles east of Kamenetz-Podolsk (Map: Russia, C 5). The chief occupation of the inhabitants is agriculture, the manufacturing industries of the town being insignificant. Population, in 1897, 9393.

GAÎTÉ, gâ'tâ', THÉÂTRE DE LA (Fr., Gaiety Theatre). One of the oldest theatres of Paris, originating in marionette shows instituted by Nicolet in 1753. A theatre was established in 1759 on the Boulevard du Temple, and in 1807, when the number of Paris theatres was restricted to eight by Napoleon, the Gâté was among those retained, presenting vaudeville, drama, and spectacular pieces. On the destruction of part of the boulevard in 1862, a new house was built in the Place des Arts et Métiers, and is the present home of the theatre. Among the many directors was Offenbach, under whom the operetta came into special prominence, but at the present time performances of all kinds are given.

GAÛS. A Roman jurist of the age of the Antonines, and the chief source of our knowledge of Roman law prior to Justinian. His personal history is almost entirely unknown, and almost every subject connected with him a subject of controversy. It is not known whether he was a Roman citizen, a foreigner, or a freedman. As to the precise age of Gaius this much is certain, that before the revision of the Roman laws and the reform of legal education by Justinian, the *Institutes* of Gaius, as well as four others of his treatises, were the received text-books of the schools of law. His *Institutes*, moreover, formed the groundwork of the *Institutes* of Justinian. From his being thus preferred to Ulpian or Papinian, it is not to be inferred that he lived after them, but only that his work was more popular. The latest jurist whom he cites is Salvius Julianus, who lived under Hadrian, and the latest Imperial edict is one of Antoninus Pius; whence it may fairly be concluded that he survived Antoninus and probably wrote under his successor.

The works of Gaius were largely used in the compilation of the *Digest* of Justinian, which contains no fewer than 535 extracts from his writings. The principal are: The *Edictum Provinciale*, in thirty-two books; the *Aurea*, in seven; the *Edictum Urbicum*; *On Trusts*; *On Mortgages*; and, above all, the *Institutes*, in four books. The last-named work is that by which Gaius is chiefly known, and it was probably the earliest complete and systematic text-book of Roman law. Although it was the basis of Justinian's *Institutes*, both as to its matter and its division, yet it was completely superseded by that work, and after a time was entirely lost, the only knowledge of it which remained being that which was gathered from the detached extracts in the *Digest*, and from the Breviary of Alaric (q.v.), or code of the Visigoths, which was known to be derived from it. In 1816 Niebuhr, while on his way to Rome, discovered, in a palimpsest manuscript in the library of the Chapel of Verona, portions of the work of some ancient jurisconsult, which was soon afterwards pronounced by Savigny to be a portion of the

Institutes of Gaius. On the publication of his report, the Berlin Academy of Sciences commissioned two German scholars, Göschen and Hollweg, in 1817, to make a copy of the entire palimpsest, which consists of 127 sheets. Nineteenth of the entire work was recovered, and was published in 1821 by Göschen, and again, after a fresh collation of the manuscript, by Blume, in 1824. A third and much-improved edition by Lachmann appeared in 1842. A comparative edition of the *Institutes of Gaius and Justinian*, by Klenze and Böcking, appeared at Berlin in 1829.

The first book was translated into German in 1824 by Von Brockdorff, and the entire work has been translated into French three several times—by Baulet, in 1826; by Domenget, in 1843; and by Pellat, in 1844. In England, it has been translated, with notes, by Post (1885), and by Abdy and Walker (1886), the latter work containing also the text and translation of Ulpian's *Fragments*. Consult: Huschke, "Zur Kritik und Interpretation von Gaius Institutionen," in his *Studien des römischen Rechts* (Breslau, 1830); also Mackeldey's *Handbook of the Roman Law*, translation (Philadelphia, 1883); Ortolan, *The History of the Roman Law*, translation (London, 1896); and Savigny, *System des heutigen römischen Rechts* (Berlin, 1840-49).

GAJ, gā, LJUDEWIT (1809-72). A Slavic writer, born at Krapina, Croatia, and educated at Vienna, Gratz, Leipzig, and Pesth. In 1835 he founded the *Novine Hrvatske* (Croatian News)—a title afterwards changed to *Hirske Narodne Novine* (Illyrian National News)—which rapidly became popular, and was followed by similar publications and by the establishment of patriotic societies of every description. The movement thus organized, which was largely instrumental in uniting the Croats and Serbs in their antagonism to the Magyars, excited considerable opposition in Hungary, and in 1844 the word 'Illyrian' was prohibited. Nevertheless, through the efforts of Gaj, a literary bond had been established among the Southern Slavs of the Hungarian crown. One of his patriotic songs, entitled "Još Hrvatska nij' propala," was extremely popular in its day.

GALABAT, gā'lā-būtt', or **KALABAT**. A small district in the northwest part of Abyssinia, adjoining Egyptian Sudan. Area, about 1540 square miles; population, 20,000. It was formerly an Egyptian province, and is settled by Tokruris from Darfur. Prior to the Italian-Abyssinian War it was in the Italian sphere of influence, but at present it forms an integral part of Abyssinia. Metamneh (Matama), the chief town, is situated close to the Egyptian frontier, and was commercially important prior to the Mahdi uprising in 1883. The population of the town is estimated at 8000.

GALACTIC CIRCLE. A great circle of the celestial sphere passing approximately through the centre of the Galaxy or Milky Way. According to Herschel, the northern pole of this circle lies in declination +27° and right ascension 12 hours 47 minutes. See GALAXY.

GALACTODENDRON (Neo-Lat., from Gk. γάλα, *gala*, milk + δένδρον, *dendron*, tree), or COW-TREE. A tree of the order Urticaceæ, indigenous to tropical South America, variously called *Brosimum galactodendron* (Don), *Galactodendron utile* (Kunth), *palo de vaca*, and *palo de*

leche. When tapped it yields a milky juice which, in its native countries, is used in tea and coffee, turns sour on exposure to the air, and deposits a caseic substance. It is closely related to the breadfruit (*Artocarpus incisa*), the breadnut (*Brosimum alicastrum*, Swartz), and to the fig (*Ficus carica*).

GALACZ, gā'lāts. See GALATZ.

GALAGO, gā-lā'gō. A genus of lemurs, native to the continent of Africa, where various species are scattered from Senegal (whence the name is said to have come) to Natal, none, however, being found in Madagascar, where other lemurs abound. They vary in size from the bigness of a cat to that of a mouse, and are some shade of gray or brown in color. They differ from the other lemurs in dentition, and conspicuously in the power of folding lengthwise, and laying close to the head, their unusually large and naked ears; their tails are long and bushy, and their hind legs of great length proportionately, due to the elongation of the bones of the ankle and foot. They are confined to forested regions, dwell in the trees, about which they leap with extraordinary agility, and where the smaller species are said to make nests resembling those of the mouse-lemurs; but frequently go upon the ground, where their customary attitude is sitting upright on their haunches. They feed upon insects, birds' eggs, fruit, etc., searching for these things mainly at night, and spending the day curled up asleep in some tree-crotch or within the clustered fronds of a palm. They thrive well in captivity and are active and interesting when wakeful. The species longest known is that from Senegal (*Galago senegalensis*), one of the smaller ones, also found throughout equatorial Africa; a closely allied species (*Galago maholi*) ranges from the lower Zambesi to Natal. The largest species are those of the West Coast (*Galago crassicaudata* and *Monteiri*); the least, Demidoff's galago, is only five inches long.

GAI'AHAD, SIB. The son of Launcelot and Elaine, and the purest knight of the Round Table, who alone was able to sit in the Siege Perilous and to recover the Holy Grail. He saw and touched the Lord's body and died. He is the hero of Walter Map's *Quest of the Holy Grail*. Consult Morley, *English Writers*, vol. iii. (London, 1887-90). See GRAIL, THE HOLY.

GA'LAM BUTTER TREE. See BUTTER TREE.

GALANGALE (AS. *gallengar*, from OF. *galingal*, *garingal*, from *galange*, *galangue*, *galangale*, from ML. *galanga*, from Ar. *khalanjān*, *khōlinjān*, from Pers. *khūlinjān*, *khavalinjān*, *galangale*, from Chin. *Ko-liang-kiang*, mild ginger of Ko, or Kao-chow-fu. in the Province of Canton, from *Ko*, or *Kao*, name of a province + *liang*, mild + *kiang*, ginger), *Alpinia*. A genus of plants embracing 30 or 40 species of the order Zingiberaceæ, with perennial stems, terminal inflorescence, succulent fruit, and rootstocks which when full-grown possess aromatic stimulating properties similar to those of ginger, for which it is much used in the East. The pure galangale is the product of *Alpinia galanga*, a native of and cultivated in the Eastern Archipelago. It has a stem six or seven feet high, broad leaves, and a branched panicle of greenish-white flowers.

The rootstock, when young, yields a kind of arrowroot, and is used as an article of food.

GALANTHUS. A genus of spring-blooming bulbs of the order Amaryllidaceæ, popularly known as snowdrops. The flowers, which appear often before the snow has melted, are normally solitary, pendulous, on scapes a few inches long, and with few exceptions white and green. The leaves, which appear with the flowers, but develop more slowly, are grass-like, and last usually until midsummer. Due to their easy culture, cheapness, extreme hardiness, and early blooming habit, snowdrops are general favorites. The bulbs are planted a few inches deep in good soil, frequently on the borders of lawns, in mid-autumn, and allowed to shift for themselves, which they often do to the great satisfaction of the grower where conditions are specially congenial. These conditions are partial shade, cool soil, and moisture.

GAL'AOB. Son of Pelion, King of Gaul, and brother of Amadis of Gaul. He is described as of a much more worldly temperament than his brother.

GALAPAGOS ISLANDS (*Sp. pron. gá-li'pá-gòs*), (*Sp., tortoise*). A group of small volcanic islands in the Pacific Ocean, crossed by the equator and extending from about longitude 89° to 92° W., about 600 miles west of Ecuador, to which it belongs (Map: Ecuador, A 8). It consists of the larger islands of Albemarle, Indefatigable, Chatham, James, and Charles, and a number of smaller islands. The total area of the group is estimated at 2400 square miles, of which Albemarle occupies over one-half. The islands are volcanic in origin and mountainous. There are supposed to exist a number of more or less active volcanoes. The climate is less hot than is usual in regions of that latitude, and the flora, though not rich, is interesting, including species peculiar only to the group or even to separate islands. Turtles are very numerous and form the chief product of the islands. There is some sugar-growing on the island of Chatham, and cattle are raised to some extent. The population is about 400. The Galapagos group was known as early as the sixteenth century, and was afterwards frequently visited by buccaneers, to whom the islands are probably indebted for their English names. They were annexed to Ecuador in 1832, and explored by Darwin in 1858.

The Galapagos Islands are of extreme interest to zoölogists, in view of the peculiarities of their fauna, and the bearing the facts have upon the evolutionary history of animals. It was the observation of them, during the voyage of the *Beagle*, which more than any other set of facts, perhaps, led Darwin to his subsequent speculations; and they figure largely in the reasonings of himself, Wallace, and all other evolutionists. While in general the fauna resembles that of South America (see NEOTROPICAL REGION), it is remarkable for having almost no species in common with the continent, and a great paucity of all forms of life except birds. The flora of the group is scanty, and more than half of its species are found nowhere else; so that it is natural to find that the land-shells, insects (mainly beetles), etc., are few and peculiar. Reptiles are represented by the famous giant tortoises, two species of snake, and four of lizards. Of the last, two are of genera confined to the

islands. One is a large burrowing iguanid, and the other 'an aquatic modification' of the same, having a semi-marine life and subsisting on seaweeds. The giant tortoises, now greatly decreased in numbers, were formerly extremely numerous and tame, and reached a huge size. (See TORTOISE.) The islands were named after them, and there were several species, each inhabiting a separate part of the archipelago. The only mammals were a mouse and a rat, which there is much reason to believe escaped from some early ship, and had time to become modified by the time they were discovered by naturalists. Birds abound, and present many interesting facts. While their resemblance on the whole is to the avifauna of Central and South America, some extraordinary relationships to the Hawaiian fauna are apparent. Forty-six genera, according to Ridgway (1896), are represented on the islands, twenty-eight of which are water-birds wandering throughout the American tropics. One rail (*Nesofelia*) is peculiar, and a sandpiper is known elsewhere only in the Sandwich Islands. Of the thirteen genera of land-birds, six are also represented in South and Central America, one (the bobolink) in North America, and four genera are peculiar: two of them are thrush-like birds, and two are ground sparrows. These genera include a large number of species not known outside of the archipelago. A striking feature in all branches of the local zoölogy is the specific disparity between animals peculiar to the different islands, each of which has its own kind. The various facts lead to the belief that an immense period of time has elapsed since the islands were colonized; that this must have gone on very slowly and accidentally (except in the case of most birds), and at long intervals; and that to a great extent there has been no intercommunication of animal life between the various islands. The archipelago is also a most fruitful illustration of insular influences on animal life and of the effects of isolation (q.v.). Consult: Darwin, *A Naturalist's Voyage* (London, 1866); Wallace, *Geographical Distribution of Animals* (New York, 1876); Salvin, *Transactions of the Zoölogical Society*, vol. ix. (London, 1876); Ridgway, "Birds of the Galapagos," in *Proceedings of the United States National Museum*, vol. xix. (Washington, 1896), and its bibliography.

GAL'APAS. A great giant, in Malory's *Morte d'Arthur*, with whom King Arthur fights, and whom he slays, by first cutting off his legs and then his head.

GALASHIELS, gál'a-shé'z'. A Parliamentary burgh and manufacturing town in the shires of Roxburgh and Selkirk, Scotland (Map: Scotland, F 4). It extends for two miles on both sides of the river Gala, above its confluence with the Tweed, 3½ miles west-northwest of Melrose. It is the chief seat of the Scotch tweed, tartan, and leather manufactures. The annual value of its products is over \$5,000,000. The United States is represented by a consular agent. In 1599 Galashiels was created a burgh of barony, and its woolen trade dates beyond 1778, when it possessed thirty looms and three 'waulk' or fulling mills. The erection of handsome public buildings, shops, and dwelling-houses has greatly improved its general aspect in recent years. Population, in 1891, 17,249; in 1901, 13,598. Consult: Craig-

Brown, *History of Selkirkshire* (Edinburgh, 1886); Douglas, *History of the Border Counties* (Edinburgh, 1899).

GALATA, gá-lá'tá. A suburb of Constantinople (q.v.).

GAL'ATE'A (Lat., from Gk. Γαλάτεια, *Galateia*). (1) In Greek mythology, a Nereid, loved by Polyphemus. She was surprised by the latter in a grotto with her preferred lover Acis, whom Polyphemus, in a fit of jealousy, crushed with a rock. Acis was turned into a stream. In other legends Galatea becomes by Polyphemus the mother of Galas. The myth has been a favorite subject for poets and sculptors of ancient and modern times. In English literature it is used in Gay's *Acis and Galatea*, Proctor's *Death of Acis*, Buchanan's *Polypheme's Passion*, and Austin Dobson's *Tale of Polypheme*. (2) A statue miraculously endowed with life by Venus at the prayer of the sculptor Pygmalion. (q.v.). (3) In Vergil's Third Eclogue, a shepherdess who throws an apple to her lover, Dámœtas, and flees to the shelter of the willows, taking care, however, to be seen; hence a type of the coquette.

GALATEA. (1) A pastoral, in prose form interspersed with lyrics, written by Cervantes in honor of his future wife, in 1583. (2) A play (originally spelled *Gallathea*), produced before Queen Elizabeth at Greenwich, London, on January 1, 1582. The scene is laid in North Lincolnshire, but the piece is directly taken from Ovid's *Metamorphoses*, book ix.

GALATEA. The challenger in the races for the America's cup in 1886, when she was twice beaten by the *Mayflower*. She was a steel cutter, built at Port Glasgow in 1885, from designs by Beavor-Webb. Her length was 102 feet, with a displacement of 157 tons and a draught of 13½ feet.

GALATEA, TRIUMPH OF. A beautiful fresco in the Villa Farnesina at Rome, designed and executed by Raphael in 1514. It represents the sea-nymph drawn in a shell by dolphins over a calm sea, and accompanied by nereids and cupids.

GALATÉE, gá-lá'tá'. (1) A pastoral romance by Florian (1783), the most successful of his works. It is drawn largely from a pastoral of Cervantes, which Florian supplemented with an additional book. (2) A two-act comic opera, based on the story of Pygmalion and Galatea, with music by Massé and words by Carré and Barbier, presented at the Opéra Comique in 1852.

GALATIA, gá-lá'shí-á (Lat., from Gk. Γαλατία). The ancient name of a portion of Asia Minor; so called from the Gauls (Gk. Γαλάται) who settled there. Early in the third century B.C. Celtic armies appeared in the Balkan Peninsula, and though driven from Greece by their defeat at Delphi, about B.C. 278, continued to terrify Thrace. About B.C. 277 the first bands entered Asia Minor on the invitation of Nicomedes, King of Bithynia, whose service they at first entered. They were from three tribes—Tolistobogi, Tectosages, and Trocmi. Of these, the first invaded Æolia and Ionia; the Tectosages, the interior; and the Trocmi, the coast lands of the Hellespont. Northern Phrygia and the border regions of Cappadocia were later conquered as a permanent home. Each of the three tribes was divided into four tetrarchies, and the twelve

tetrarchs formed the supreme government, with a council of 400 as advisers. The Gauls did not settle in the cities, where the native population continued with but little change, but, serving as mercenaries in the armies of the Greek kings of the East, made the neighboring territories pay tribute to escape their ravages. A succession of defeats at the hands of Attalus I. of Pergamum, about B.C. 235, seems to have checked their incursions and confined them to their later boundaries between Bithynia and Paphlagonia on the north, Pontus on the east, Cappadocia, Lycaonia on the south, and Phrygia on the west. Having sided with Antiochus against the Romans, the Galatians were severely punished by the Consul Manlius, B.C. 189. They sided with Pompeius against Mithridates, and the Romans gave one of the tetrarchs, Deiotarus, the title of king. After the death of his successor, Amyntas, Augustus made the country a Roman province, divided under Theodosius into *Galatia prima*, with the capital Ancyra, and *Galatia secunda*, with the capital Pessinus. The majority of the Gauls of Galatia—probably those of the country districts—retained their old Celtic language as late as the time of Jerome (fourth century), who says that they spoke the same dialect as the people about Treves; it is certain, however, that the ruling classes, like the original inhabitants, used Greek. Galatia was twice visited by the Apostle Paul (Acts xvi. 6; xviii. 23). Just what part of the province was visited is not clear. In the latter passage what is meant is evidently the Lycaonian part of the Roman province Galatia, in which were the cities Derbe, Lystra, and Iconium, and also, probably, the Pisidian part, in which Antioch belonged. In xvi. 6 the meaning is more uncertain, since we do not know just where the missionaries turned northward; but here also it is impossible that old Galatia proper is meant. Probably the churches of Antioch in Pisidia, Iconium, Lystra, and Derbe, founded by Paul on his first missionary tour (Acts xiii. xiv.), were among the churches to which the Epistle to the Galatians was addressed. In so addressing his letter, Paul evidently had in mind the relation of his readers to the Empire, not their various ethnic affinities.

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GALATIANS, gá-lá'shanz. EPISTLE TO THE. One of the letters of Paul in the New Testament. It is addressed, most probably, to the churches visited by himself and Barnabas on the first mission tour (spring A.D. 47-fall 48), which were situated in the southern part of the large Roman province of Galatia (q.v.) and were composed predominantly of Gentiles, though evidently containing a considerable element of Jews. The letter was occasioned by efforts which were

being made within the membership of the churches by outside agitators to bring about an observance of the ceremonialism of the Mosaic law—especially the rite of circumcision—as essential to salvation, and is consequently marked by a vigorous presentation on the Apostle's part of his fundamental doctrine of justification by faith and not by works.

The main problem in the criticism of the letter is its date, which has been variously conjectured from early to late in Paul's ministry, and perhaps is impossible of absolute settlement. In view, however, of the close resemblance in thought which the letter has to the letter to the Romans and its lack of similar resemblance to the Corinthian letters, especially in view of the fact that, though the situation in Corinth was one which promised to become identical with that in Galatia, there is a striking absence in the Corinthian correspondence of all warning against the serious dangers ahead, which the Apostle could scarcely have refrained from giving had he already passed through the Galatian experience, it would seem probable that its writing occurred between that of II. Corinthians and Romans—in other words, toward the latter part of the Apostle's lengthened journey from Ephesus to Corinth (spring-fall A.D. 55), possibly while he was engaged in mission work in the Province of Epirus (see Rom. xv. 18, 19).

In objection to this argument it is urged that Paul wrote his letters to meet the particular needs of individual churches, which needs might be similar in widely separate fields and at widely different times; so that similarity of thought between Romans and Galatians does not necessarily imply sequence in time of composition. This objection, however, lacks all force from the fact that the significant thing here is not so much the similarity between Romans and Galatians as the dissimilarity between Galatians and Corinthians in spite of the acknowledged similarity in the situations to which they were addressed. Compare the indifferent way in which circumcision is treated in I. Cor. vii. 18, 19, and the general lack of reference in I. and II. Corinthians to the vital difference between salvation by faith and by works, with the serious treatment of circumcision in Gal. v. 2, 3, 6; vi. 12-15, and the absorbing discussion in the letter of the grounds of justification. And yet notice how similar to the situation in Galatia the Corinthian situation had become by the time II. Cor. chs. x.-xiii. were written (II. Cor. xi. 4, 5, 12-15, 21-23; xii. 11, 12). Equally lacking in force is the objection that, according to iv. 13, "Ye know that because of an infirmity of the flesh I preached the Gospel unto you at the former time" [τὸ ἡσθένειν], Paul had visited these churches but twice prior to his writing, which would make it impossible for the letter to have been written as late as the end of his third mission tour; since the New Testament usage of the comparative degree in general, and of the phrase τὸ ἡσθένειν, in particular, makes it perfectly possible to render it here 'formerly,' or even 'at the first.' In positive agreement with this dating is the peculiar phrase in the address of the letter (i. 1, 2, "Paul . . . and all the brethren that are with me unto the churches of Galatia"), which, with the absence of all local color in the surroundings of the Apostle, points rather to the situation of a journey than of a

city residence. Further is the statement of iv. 20 ("But I could wish to be present with you now, and to change my tone; for I am perplexed about you"), which would seem to show the writer as far removed from the readers and beyond the likelihood of a near visit to them. Finally, Rom. xv. 26 gives the list of churches contributing to the collection which was being gathered by the Apostle for the Jerusalem church, and which he took with him on his last visit to that city. This list is evidently the final one, since it was directly after this that the Apostle began his voyage to the Holy City; but it contains no mention of the Galatian churches, though the fact of such a collection among them, evidently in process of being gathered, is referred to in I. Cor. xvi. 1. Evidently some time between I. Corinthians and Romans had come the rupture between the Apostle and those churches which stopped the collection.

The letter is one of the group of four (I. II. Corinthians, Galatians, Romans) which have been almost universally attributed to a Pauline authorship. Bruno Bauer's rejection of all the letters of Paul (1850-52) as unapostolic products of the second century, made no impression as far as this group was concerned—the Tübingen School constituting them, in fact, the standard of genuineness for all their New Testament criticism; while the recent attempt by the Dutch School of documentary critics to make the letter a composite writing by a post-apostolic author, compiled largely from Romans, Corinthians, and the Book of Acts, has been generally considered by the critical world as not proven.

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GALATINA, gá'la-tě'ná. A city in South Italy, 45 miles southeast of Brindisi (Map: Italy, N 7). It has a church dating from 1384, which contains the grave of Balzo Orsini. It markets oil, wine, and cotton. Population of commune, in 1881, 11,000; in 1901, 14,000.

GALATZ, gá'láts, or **GALACZ** (Rum. *Galati*). A city of Rumania, in Moldavia, situated

on the left bank of the Danube, between the mouths of the Pruth and the Sereth (Map: Balkan Peninsula, F 2). It is divided into the old and the new town. The latter is well built, and is the seat of a bishop and of the European commission for the control of navigation on the Danube. There are numerous extensive storehouses, grain elevators, a shipyard, and a large bazaar. Galatz is one of the leading ports on the Danube. The imports, for the most part, consist of textiles and metal goods; the exports are mainly cereals, cattle, and lumber. The annual shipping amounts to about 1,000,000 tons. There are numerous foreign consular agents. Population, in 1890, 59,143; in 1899, 62,678. Galatz has figured prominently in the wars between Russia and Turkey. It was a free port previous to 1883.

GAL'AXY (from Lat. *galaxias*, Gk. γαλαξίας, *galaxias*, milky way, from γάλα, *gala*, milk), or **MILKY WAY**. The luminous band, seen at night, which forms a zone encircling the sphere almost in a great circle. At one part of its course it opens up into two branches, one faint and interrupted, the other bright and continuous, which do not reunite till after remaining distinct for about 150°. This great zone has occupied the same position in the heavens since the earliest ages. Its course, as traced by the naked eye, following the line of its greatest brightness, conforms nearly to that of a great circle, called the 'galactic circle,' inclined at an angle of about 62° 30' to the equinoctial, and cutting that circle in 0 h. 49.1 m. and 12 h. 49.1 m. right ascension. Throughout the space where, as above stated, it is divided into two branches, this great circle is intermediate to those branches lying nearer that which is the brighter and more continuous. The Galaxy is wanting in regularity of outline. Besides the two great branches into which it divides, it has many smaller ones which spring out from it. At one point it diffuses itself very broadly, and opens out into a fan-like expanse of interlacing branches nearly 20° in breadth. At the same point, the branches terminating abruptly, a wide gap presents itself in the zone, on the opposite side of which it recommences its course with a similar assemblage of branches. At other points its course is irregular, patchy, and winding; while at more than one point, in the midst of its brightest parts, broad dark spaces occur. One of these, known from early times among navigators as the 'coal-sack,' is a singular pear-shaped vacancy about 8° long and 5° broad, occurring in the centre of a bright area overlying portions of the constellations of the Cross and Centaur. The 'coal-sack' occupies about half the breadth of this bright space, and presents only one star visible to the naked eye, though it contains many telescopic stars. Its blackness, which attracts the most superficial observer, is thus due to the contrast with the brilliant ground by which it is surrounded. The Galaxy was examined by Sir William Herschel with his powerful telescope, and found to be composed entirely of stars. Modern photographic researches have added but little to Herschel's observations as to the structure of the Galaxy; but some of his conclusions concerning the form of the sidereal universe are no longer tenable. See **STAR**.

GAL'BA, **SERVIUS Sulpicius** (B.C. 3-A.D. 69). Roman Emperor from June, A.D. 68, to January

15, 69. Born December 24, B.C. 3, of a respectable family, he was raised to the consulship in A.D. 33, and in the administration of the Province of Aquitania under Tiberius, of Germany under Caligula, of Africa under Claudius, and of Hispania Tarraconensis under Nero, he distinguished himself for bravery, strictness, and justice. His friends had urged him, on the death of Caligula, to take possession of the throne, but he continued faithful to Claudius, and therefore stood high in his favor. In 68 Julius Vindex rose with the Gallic legions against Nero, and called on Galba to assume the Imperial dignity and thus rid the earth of its oppressor. Galba, who had been informed that Nero was contriving his death, came forward against him at first as the legate of the Roman people, and it was only when he heard of Nero's death that he proceeded to Rome to take possession of the throne offered him by the Prætorians. Galba was now upward of seventy years old, and it soon appeared that his character had deteriorated, as, indeed, had already been manifested in his later administrations. Indulgence to greedy favorites, ill-timed severity, above all, avarice, which led him to withhold the usual donatives to the troops, made him unpopular. The legions in upper Germany called on the Prætorians to choose another emperor; Galba thought to soothe them by adopting Piso as his coadjutor and successor; but he thus offended Otho, who, as administrator of Lusitania, had supported Galba, and looked to be rewarded. The Prætorians, who had received no donative on the occasion of Piso's adoption, were easily excited to insurrection by Otho, and the Emperor, having gone out to quell the rebellion, was cut down by the soldiers as he crossed the Forum.

GAL'BANUM (Lat., from Gk. χαλβάνη, *chalbanē*, from Heb. *khebenah*, galbanum, from *khā-lab*, to be fat). A soft, ductile, white gum resin used in medicine like asafetida, principally in cases of chronic catarrh, and, especially by the Germans, in amenorrhœa and chronic rheumatism. Though sometimes applied externally in plasters as a mild stimulant in indolent swellings, it is generally administered in the form of the compound galbanum pill, which contains galbanum, sagapenum, asafetida, myrrh, and soft soap. It is brought from the Levant in tears or in large masses, which become yellowish with age and which have a peculiar balsamic odor and acrid, bitter taste. Although it is mentioned in Ex. xxx. 34, the plant from which it is derived has not been definitely determined. Since *Polypodium orientale*, *Ferula galbaniflua*, and *Ferula rubricaulis*, all of the order Umbellifera, have been supposed to be the source of galbanum, it is highly probable that it is the product of an umbelliferous plant. But the confidence with which the species have been so represented has perhaps prevented travelers from making that inquiry into the subject which otherwise they might have made. *Peucedanum Galbanum*, a plant of this order found at the Cape of Good Hope, yields a gum resin very similar to galbanum.

GALCHAS, *gāl'chaz*. The designation of a number of tribes in the plateaus and valleys of the Pamir and Hindu Kush, in Ferghana, the basins of the Zerafshan, Amu Darya, etc., who physically belong to the white race, and linguistically to the Aryan stock. They are generally

thick-set, brachycephalic, and in some other respects resemble what Ripley (1899) calls "the ideal Alpine or Celtic European race"—a relationship recognized by Topinard in 1878, and since then by Ujfalvy, etc. They are thus one of the farthest Aryan outliers in Central Asia. In religion they profess, mostly, Islam of the Sunnite creed. Since their residence in this region their physical characteristics have been somewhat modified by intermixture with other peoples of the environment. Keane (1896) ranks the language of the Galchas as an independent branch of the Aryan family; some other authorities make it more nearly akin to the Iranian tongues. The anthropology of the Galchas has been discussed by Ujfalvy in the *Revue d'Anthropologie* for 1879, and the *Bulletins de la Société d'Anthropologie de Paris* for 1887, and more briefly by Ripley in his *Races of Europe* (New York, 1899).

GALDÓS, gál-dós', BENITO PEREZ. See PEREZ-GALDÓS, BENITO.

GALE (probably connected with Dan. *gal*, Icel. *galinn*, furious, from *gala*, to chant). A strong wind varying in velocity (according to the technical classification) from 18.5 to 32 miles per hour; the corresponding wind pressures are 1.5 and 4.5 pounds per square foot. Gales are described as moderate, fresh, and strong, or whole gales. On sailing ships, ordinarily, very little sail is carried in gales; when they are very strong, only close-reefed topsails, staysail and spanker. If running with the wind free, a close-reefed foresail may also be set. In fresh or moderate gales more sail is carried. See WIND; BEAUFORT SCALE.

GALE (in botany). See CANDLEBERRY.

GALE, NORMAN ROWLAND (1862—). An English poet. He was born at Kew, in Surrey, March 4, 1862; was educated at Exeter College, Oxford, graduating B.A. in 1884, and subsequently took pupils, as described in the poem "June in London." Between 1888 and 1891 he published privately at Rugby several verse pamphlets, including: *Anemones*; *Cricket Songs and Other Trifling Verses*; *Meadowsweet*; *Violets*. In 1892 appeared *A Country Muse*, which was followed later in the same year by a new series under the same title. These collections consist mainly of lyrics, in which the two motives of love and nature are united with great charm, recalling, indeed, the manner of Herrick. As representative of their scope may be cited from the second series: "A Thief;" "The Shaded Pool;" "A Pastoral;" and "Leafy Warwickshire." He has since published: *Orchard Songs* (1893), concluding with "A Defense," written in reply to the charge of undue frankness in depicting country manners; *Cricket Songs*, a reissue (1894); *A June Pastoral* (1894), which is an idyl in prose, with scattered verse; and *Songs for Little People* (1896).

GALE, THEOPHILUS (1628-78). An English Nonconformist divine. He was born at Kingsteignton, Devonshire, and was educated at Oxford. After preaching at Winchester Cathedral for three years, he was dismissed because of his Nonconformist views, and devoted himself to teaching. Shortly before his death he was appointed to the pastorate of an independent congregation at Holborn. His fame rests chiefly upon the erudite work to the preparation of

which he devoted the greater part of his life, and which is entitled *The Court of the Gentiles; or, A Discourse Touching the Original of Humane Literature from the Scriptures and Jewish Churches* (1669-78), in which he expresses the view that all theology, philology, and philosophy may be traced to Jewish sources.

GALE, THOMAS (c.1635-1702). An English author. He was born at Scruton, Yorkshire, and was educated at Cambridge. Here he occupied the chair of Greek from 1666 to 1672, when he was appointed high master of Saint Paul's School, where he remained for twenty-five years. He was Dean of York during the last five years of his life. He was widely celebrated for his scholarship, and published the following works: *Opuscula Mythologica, Ethica et Physica* (10 parts, 1671); *Historiæ Poeticæ Scriptores Antiqui* (1675); *Historiæ Britannicæ, Saxonicæ, Anglo-Danicæ Scriptores* (1691); *Rhetores Selecti. Demetrius Phalereus, Tiberius Rhetor, Anonymus Sophista, Severus Alexandrinus, Græce et Latine* (1676).

GALEAZZO, gā'lā-āt'sō, GIAN. See VISCONTI.

GALEN (Gk. Γαληνός, *galēnos*), or CLAUDIUS GALENUS (130-201?). A celebrated physician, born at Pergamus, in Mysia. He first studied medicine at Pergamus, afterwards at Smyrna, Corinth, and Alexandria. He returned to his native city in his twenty-ninth year, and was at once appointed physician to the school of gladiators. In his thirty-fourth year he went to Rome, where he stayed about four years, and was offered, but declined, the post of physician to the Emperor. He returned to his native country in his thirty-eighth year, and had scarcely resumed his ordinary course of life when he received a summons from the emperors M. Aurelius and L. Verus to attend them on the northeastern frontiers of Italy, whither they had gone to make preparations for a war with the northern tribes. He joined the camp toward the end of the year 169; but a pestilence breaking out, the emperors and their court set off for Rome, whither Galen accompanied or followed them. The place and date of his death are not known with certainty, but it is believed that he died in Sicily.

The works that are still extant under the name of Galen consist of 83 treatises acknowledged to be genuine, 19 whose genuineness has been questioned, 45 undoubtedly spurious, 19 fragments, and 15 commentaries on different works of Hippocrates. Besides these, he wrote a great number of works whose titles only are preserved, and altogether it is believed that the number of his distinct treatises cannot have been less than 500. We may divide his works into: (1) Those on anatomy and physiology; (2) those on dietetics and hygiene; (3) those on pathology; (4) those on diagnosis and semeiology; (5) those on pharmacy and materia medica; (6) those on therapeutics, including surgery; (7) his commentaries on Hippocrates; and (8) his philosophical and miscellaneous works. We have most of these works in Greek, the language in which they were originally written; some are, however, preserved in Latin translations, and a few only in Arabic. His most important anatomical and physiological works are: *De Anatomicis Administrationibus* and *De Usu Partium Corporis Humani*. His anatomical and physiological writings are by far the most valu-

able of his works. They contain undoubted evidence of his familiarity with practical anatomy; but whether he derived his knowledge from dissections of human bodies or those of the lower animals is uncertain. The latter is the most probable view, (1) because he frequently recommends the dissection of apes, bears, goats, etc., and (2) because he mentions, as something extraordinary, that those physicians who attended the Emperor M. Aurelius in his wars against the Germans had an opportunity of dissecting the bodies of the barbarians. His pathology was very speculative and imperfect. In his diagnosis and prognosis he laid great stress on the pulse, on which subject he may be considered as the first and greatest authority, for all subsequent writers adopted his system without alteration. He likewise placed great confidence in the doctrine of critical days, which he believed to be influenced by the moon. In *materia medica* his authority was not so high as that of Dioscorides. Numerous ingredients, many of which were probably inert, enter into most of his prescriptions, and he seems to place a more implicit faith in amulets than in medicine. His practice is based on two fundamental principles: (1) that disease is something contrary to nature, and is to be overcome by that which is contrary to the disease itself; and (2) that nature is to be preserved by that which has relation to nature. Judged by modern standards, his ideas and practice were of course childish.

Before Galen's time the medical profession was divided into several antagonistic sects, including the Dogmatici, Empirici, Eclectic, Pneumatici, and Episynthetic. After his time all these sects merged into one, the Galenici. The subsequent Greek and Roman medical writers were mere compilers from his writings, and as soon as his works were translated (in the ninth century) into Arabic, they were at once adopted throughout the East, to the exclusion of all others. The Greek text has been published four times. The first edition was the Aldine, printed in 1525, in five folio volumes; the most complete edition is that of Kühn, in twenty octavo volumes, the publication of which extended from 1821 to 1833. Galen's minor works were edited by Müller and Helmrich, and published in three volumes at Leipzig (1884-93). Several of Galen's works have been translated into French or German. Kidd, in the *Transactions of the Provincial Medical and Surgical Association*, vol. vi. (London, 1837), gives a good account of Galen's anatomical and physiological knowledge. Consult Daremberg, *Exposition des connaissances de Galien sur l'anatomie* (Paris, 1841), an epitome of which in English has been published, from the pen of Coxie (Philadelphia, 1846). Consult also Ilberg, "Die Schriftsteller des Klaudios Galenos," in the *Rhenisches Museum für Philologie* for 1889, 1892, and 1896.

GALEN, gä'len. CHRISTOPH BERNHARD VON (1606-78). A German prelate and soldier. He was born in Westphalia, and was educated at the universities of Cologne, Mainz, Louvain, and Bordeaux. After being coincidentally Canon of Münster and commander of a regiment on the Rhine, he was made Prince Bishop of Münster in 1650. He was exceedingly ambitious, and strove to increase his power, both by reducing his subjects to complete submission and by extending his

possessions without. By 1661 he had made himself master of the city, and he turned at once to foreign alliances to carry out his designs. With a well-trained army he joined England against the Netherlands in 1665, but was forced to make peace in 1666. He joined Louis XIV. against the Dutch (1672), and waged war successfully against them, and then turned his arms against the Elector of Brandenburg and the Emperor. In 1675 he joined the Emperor against France; he next helped the Danes against Sweden, and secured the Duchy of Verden and part of the Duchy of Bremen; in 1677 he helped the Spaniards against the French; in 1678 he invaded East Friesland and extorted a large war indemnity. He died September 19, 1678, during the negotiations leading to the Peace of Nimeguen. In spite of his military activity he found time to introduce many meritorious ecclesiastical reforms. Consult: Tücking, *Geschichte des Stifts Münster unter Christoph Bernhard von Galen* (Münster, 1865); Hüsing, *Fürstbischof Christoph Bernhard von Galen, ein katholischer Reformator* (Münster, 1887).

GALEN, PHILIPP. See LANGE, ERNST P. K.

GALENA. A city, port of entry, and the county-seat of Jo Daviess County, Ill., 17 miles southeast of Dubuque, Iowa; on the Galena River, which affords good water-power, and on the Illinois Central, the Chicago and Northwestern, and the Chicago, Burlington and Quincy railroads (Map: Illinois, B 1). It has a public library, a fine United States Government custom-house, and Grant Park, in which is a statue of General Grant. Galena carries on an important trade by river and rail, and has smelting-works, shoe-factories, etc.; but the city is noted primarily as the centre of extensive lead and zinc mining interests. Under a charter of 1852, the government is vested in a mayor, biennially elected, and a city council. The electric-light plant is owned and operated by the municipality. Population, in 1890, 5635; in 1900, 5005. Galena (named from the abundance of lead sulphide or galena ore in the vicinity) was settled in 1827 and was incorporated as a city in 1839. Gen. U. S. Grant lived here from May, 1860, until the opening of the Civil War, and the Grant homestead still remains as one of the features of the city.

GALENA. A city of remarkable growth during the last ten years, in Cherokee County, Kan., seven miles west of Joplin, Mo.; on the Saint Louis and San Francisco and the Kansas City, Fort Scott and Memphis railroads (Map: Kansas, H 4). It is engaged chiefly in mining, being the centre of an important lead and zinc region. The mining district, about four miles square, has 200 concentrating mills, and employs 3000 men. Over \$4,300,000 worth of ore was mined in the year 1900, and conditions are favorable to an increase in the output. Among the industrial establishments of the city are lead-smelters, a large foundry, and a planing-mill. The government is administered by a mayor, who holds office for two years, and a unicameral council, which elects the deputy marshals and police. The mayor nominates the collector, sexton, and engineer; other officials are chosen by the people. Galena was settled and incorporated in 1877, and its population increased from 1463 in 1880, and 2496 in 1890, to 10,155 in 1900.

GALENA (Lat., from Gk. γαλῆνη, *galênê*, lead ore), or **LEAD GLANCE**. A lead sulphide that crystallizes in the isometric system. It occurs crystallized, fibrous, granular, or cryptocrystalline, and has a pure lead-gray color and a metallic lustre. Galena occurs in beds and veins, both in crystalline and amorphous rocks, and is one of the most widely distributed of the metallic sulphides. It is found in Freiberg, Saxony; in Pibram, Bohemia; in Spain; in Cornwall, Derbyshire, and Cumberland, England; in New South Wales, Mexico, and at various other localities throughout the world. In the United States it occurs in caves or gash veins in stratified limestone, especially at various localities in Illinois, Iowa, Missouri, and Wisconsin. When pure it contains 86.6 per cent. of metallic lead; but it is usually accompanied by other metals, such as antimony, bismuth, cadmium, zinc, and especially silver. It is an important ore of lead, and is often worked also for silver, especially in Colorado, Idaho, Montana, and other Rocky Mountain States, and in British Columbia. A coarse-grained variety of galena is used to glaze pottery, and is sometimes called *potters' ore*. See **LEAD**.

GALENIC, GALENIST. Words having reference to the controversies of the period of the revival of letters, when the authority of Galen was strongly asserted against all innovations, and particularly against the introduction of chemical methods of treatment into medicine. The Galenists adhered to the ancient formulas, in which drugs were prescribed either in substance or in the form of tinctures and extracts, etc., while the chemists professed to extract from them the essences, or quintessences—i.e. substances in small bulk, presumed to contain the whole virtues of the original drugs in a state of extreme concentration, or purified from all gross and pernicious or superfluous matter. Medicines prepared by decoction or infusion, as distinguished from those prepared by chemical processes, are still termed *galenic* medicines.

GALEOMYOMACHIA, gá'lê-ô-mí'ô-má'kl-â (Lat., from Gk. γαλεομιομαχία, Battle of the Cats and Mice). A Greek mock-heroic poem by Theodorus Prodromus, a twelfth-century monk. In its general features it is only an imitation of the *Batrachomyomachia* (q.v.).

GA'LEOPITHE'CUS. See **COBEGO**.

GALEOTTO, gá'lâ-ô'tt'ô, **PRINCIPE**. Another title of Boccaccio's *Decameron* (q.v.), suggested by the name of the book, to the reading of which Dante makes Francesca attribute her sin with Paolo.

GALERIE DES GLACES, gá'le-rê' dâ glâs (Fr., gallery of mirrors). A famous gallery in the Palace of Versailles, France, one of the most magnificent rooms in the world. It is nearly 250 feet long, 40 feet wide, and over 20 feet high, and is profusely adorned with paintings, etc., of the time of Louis XIV. It was designed for balls and fêtes, and on particularly grand occasions was also used as the throne-room. In it William I. was crowned German Emperor in 1871, during the siege of Paris.

GALE'RIUS, VALERIUS MAXIMIANUS (?-A.D. 311). A Roman Emperor (A.D. 305-11). He was born, of humble parentage, near Serdica, in Dacia; entered the Imperial army, and rose from one grade of military rank to another until

Diocletian conferred on him, along with Constantius Chlorus, the title of Cæsar (A.D. 292), and gave him his daughter in marriage. On the abdication of Diocletian (A.D. 305), he and Constantius became *Augusti*, or joint rulers, of the Roman Empire. On the death of Constantius at York (A.D. 306), the troops in Britain and Gaul immediately declared their allegiance to his son Constantine (afterwards Constantine the Great), much to the chagrin of Galerius, who expected the entire sovereignty of Rome to fall into his hands. He died in A.D. 311. Galerius was a brave soldier and a skillful commander, but appears to possess no other claims to the respect of posterity. He hated the Christians, and it is believed that it was he who forced Diocletian to issue his famous edict against them, which caused the last of the Imperial persecutions. It is highly probable that his treatment of the adherents to the Christian faith was determined in great part by a politic opposition to Constantius and his son, who tolerated, and even respected, the new opinions and practices.

GALES, JOSEPH (1786-1860). An American journalist, born in Eckington, Yorkshire, England. His father, Joseph Gales, the elder, was a printer in Sheffield, who was compelled to emigrate to America in 1793 because of his republican principles. The son was educated at the University of North Carolina, followed the trade of his father, and in 1807 settled in Washington, where he became the assistant and partner of Samuel Harrison Smith in the publication of the *National Intelligencer*. In 1810 Gales became sole proprietor of the journal, and made it a tri-weekly publication, and in 1813, he having previously formed a partnership with his brother-in-law, William Winston Seaton, the paper was issued daily, and so continued until 1867, after the death of both publishers. For many years Gales and Seaton were the official printers to Congress, and the files of the *National Intelligencer*, containing a running account of the debates in both Houses, are one of the most valuable sources of United States Congressional history for more than a quarter of a century. Under the title of *Annals of Congress*, Gales and Seaton published (1834-56), in forty-two volumes, the debates in Congress from 1798 to 1824, together with the more important documents and laws, and under the title of *Register of Debates in Congress* (29 vols.), continued the publication in similar form to cover the years 1824-37.

GALESBURG. A city and the county-seat of Knox County, Ill., 43 miles east by north of Burlington, Iowa; on the Atchison, Topeka and Santa Fé, the Chicago, Burlington and Quincy, and other railroads (Map: Illinois, B 3). It is the seat of Knox College (non-sectarian), founded in 1837; the scene of a famous Lincoln-Douglas debate of 1859; Lombard University (Universalist), established in 1852; and the Ryder Divinity School and Saint Joseph's Academy (Roman Catholic). The city has an attractive situation, and is widely known for its educational facilities. There is a public library of about 25,400 volumes. Among the industrial establishments are the Burlington Railroad shops and stock-yards, brick-making plants, boiler and engine works, iron-foundries, farming-implement works, and carriage and wagon factories. The government is administered under a general State

law of 1872, by a mayor, elected every two years, and a unicameral council. The majority of subordinate administrative officials are appointed by the executive, subject to the consent of the council. The city owns and operates its water-works and electric-light plant. Population, in 1890, 15,264; in 1900, 18,607. Galesburg was settled in 1837 by a company from New York State, and was named in honor of the Rev. George W. Gale, who had planned the town as a site for a theological seminary, and as a rallying-place for 'free-soilers,' since the pro-slavery immigration was then threatening to make Illinois a slave State. The city was chartered in 1857. Consult *History of Knox County* (Chicago, 1878).

GALI, gá'lé, FRANCISCO (1539-91). A Spanish navigator, born in Seville. The Viceroy of Mexico engaged him to find a harbor on the western coast of America for Spanish vessels returning from the East Indies, and he set out from Acapulco with that object in view. He visited the Philippines and other neighboring islands, and Japan, and on his way home (1584) discovered the present Bay of San Francisco. Linschot translated into Dutch Gali's account of his expedition, and included it in his work *Track Charts of the Indies* (1596), and Wolf made an English translation in 1598. From a French version of the same narrative a Spanish translation was also made (1802), and there are in the National Library of Mexico fragments of an account of the expedition written by Gali, under the title *Viaje, descubrimientos y observaciones de Acapulco á Filipinas*.

GALIANI, gá-lyá'né, FERDINANDO (1728-87). An Italian savant, born in Chieti, in the Abruzzi. Philosophy, archaeology, history, and more especially the science of political economy, were his favorite studies; but he first attracted notice by a clever squib on the death of the public executioner. This consisted of a collection of essays eulogistic of the deceased, in which the style of the president and leading members of the Neapolitan Academy was admirably imitated. His next publication, *Della Moneta*, written when he was barely twenty, evinced his great learning and powers of reflection, and must be regarded as a valuable contribution to the science of political economy. In 1751 he visited the chief cities of Italy, and was everywhere honorably received. On his return to Naples he collected a rich assortment of stones and volcanic matter of Vesuvius, which, accompanied by a thesis, he subsequently presented to the Pope. On one of the stone specimens he engraved the following suggestive inscription: "Beatissime pater, fac ut lapides isti panes fiant," and received, by way of answer, the rich prebend of Amalfi, for which he had previously qualified himself by entering into orders. In 1759 he became secretary to the Neapolitan embassy at Paris. From his sojourn at Paris dates a voluminous correspondence with political, scientific, and literary personages of the day, an edition of which has appeared by Percy and Maugras (Paris, 1881). In 1767 he visited England, whose social and political institutions he studied deeply. On his return to Paris, he wrote another treatise on political economy, entitled *Dialoghi sul commercio del grano*, in which he argues against both the extreme protectionists and the

pure free-traders. Being recalled to Naples, he was successively appointed to various posts of trust and importance. He died at Naples in 1787, leaving behind him rare collections of music manuscripts, cameos, etc. Consult: Diodati, *Vita dell' abate Ferdinando Galiani* (Naples, 1878); Mattei, *Galiani ed i suoi tempi* (Naples, 1879); Contes, *lettres et pensées de l'abbé Galiani* (Paris, 1866); Du Bois-Reymond, *Darwin versus Galiani* (Berlin, 1876). Consult also, Brunetiere in *Etudes critiques*, vol. ii. (Paris, 1889).

GALICIA, gá-lish'á (Ger. *Galizien*). The largest of the Austrian crownlands, situated in the northeastern part of Austria-Hungary, bounded by Russia on the north and east, Bukowina on the southeast, Hungary on the south and southwest, and Austrian and Prussian Silesia on the west (Map: Austria, H 2). Its area is over 30,300 square miles. Separated from Hungary by the Carpathians, the surface of Galicia inclines toward the north, while the interior consists mostly of hills and elevated plateaus. The northern part is a gently rolling plain. Galicia is abundantly watered by the Vistula and its affluents, and also by the Dniester, which drains the southern part of the province. The latter flows southeast, and is navigable from Sambor. The Pruth also flows through the southern part of Galicia. The Vistula is navigable at Cracow, and, flowing northeast, forms part of the boundary of Russian Poland. Among its tributaries in Galicia are the San and Dunajec, both navigable, and the Bug. There are no lakes of consequence, but mineral springs abound, some of them of more than provincial repute. The climate, owing to the exposed northern position of the crownland, is colder than that of any other part of Austria-Hungary. The winters are generally long and severe, while the summers are hot.

Galicia is more purely agricultural than any other of the crownlands of Austria, no less than 77 per cent. of its population depending for a living directly on the soil. The soil, with the exception of some sandy and marshy districts, is fertile, and produces wheat, barley, rye, oats, maize, etc. Flax, hemp, tobacco, hops, beets, etc., are likewise cultivated. The production of cereals is generally more than sufficient to meet the domestic demand, considerable quantities being in fact exported. Horses, cattle, and sheep are raised in large numbers. The unequal distribution of the land is shown by the fact that while one-third of the cultivable area is in the hands of large landholders owning estates of over 1400 acres each, about one-half consists of holdings of less than 14 acres in extent. This state of affairs, together with the industrial backwardness of the country, is chiefly responsible for the wretched condition of the agricultural classes. Most of the peasants are unable to make a living from their small farms, and are consequently obliged to emigrate in large numbers for a part of the year to Russia, Russian Poland, and Germany, where they work for low wages, while their families attend to the farms at home.

The forests of Galicia occupy about 25 per cent. of the total area of the country, and yield large quantities of timber for export to foreign countries, chiefly to Germany. The mineral industries are insignificant, with the exception of rock salt, of which there are extensive deposits, those of Wieliczka being famous. Petroleum is obtained

in large quantities, and the refining industry is assuming very great importance. The manufactured articles of Galicia are mainly the output of house industries. Weaving, brewing, and distilling, and the production of small wooden articles are the leading industries. There is, however, an improvement in some branches of manufacture, notably in that of textiles. The trade is almost exclusively in the hands of the Jews, and is hindered by the Russian trade policy. The transit business, nevertheless, is somewhat important. The leading exports are petroleum, salt, ozocerite, lumber, grain, cattle, and linens. In 1898 there were in Galicia 2000 miles of railway.

The Constitution of Galicia dates from 1861. The Diet is composed of 154 members, consisting of three archbishops, five bishops, two rectors of universities, 44 representatives of the landed aristocracy, 20 representatives of towns and industrial centres, three from the chambers of commerce and industries, and 77 from the rural communities. In the Austrian Lower House Galicia is represented by 78 delegates, of whom 15 are elected by all voters, while of the remaining 63, 20 are sent by the large landholders, 13 by the towns, 3 by the chambers of commerce and industry, and 27 by the rural communities. For the purpose of administration Galicia is divided into 78 counties, and the two cities of Lemberg and Cracow. The population of Galicia in 1900 was 7,295,538, showing an increase of 10.4 per cent. for the period 1890-1900. According to nationality, as determined by the language spoken, the population is composed as follows: Poles, 53 per cent.; Ruthenians, 43 per cent.; the remainder mainly German. As to religion, over 45 per cent. are Roman Catholic, 42 per cent. Greek, and about 11 per cent. Jews. In 1890 over 73 per cent. of the population could neither read nor write. Higher education is afforded by universities at Cracow and Lemberg. The important cities are Lemberg, the capital; Cracow, Tarnow, Brody, Tarnopol, Przemyśl, and Kolomea.

The original Germanic population of what is now Galicia was replaced at the beginning of the Middle Ages, at the time of the great migration of nations by the Slavic Poles and Ruthenians, who settled to the west and the east, respectively, of the River San. In the twelfth century the principalities of Halicz (Galicia) and Vladimir (Lodomeria) rose to prominence from among a host of petty States. Galicia in general acknowledged the suzerainty of the dukes of Cracow, while Lodomeria was under the control of the ruler of Kiev. The dissensions between the two principalities afforded an opportunity for the intervention of the Hungarians, the Russians, and the Poles, but such periods of foreign rule were brief. In 1198 Roman, Prince of Lodomeria, succeeded in annexing Galicia to his dominions, and made himself virtually independent of Poland and Hungary; the two duchies were separated in 1215, but were once more united by Daniel Romanovitch (1222-66), who by his skillful diplomacy in his relations with Hungary and the Pope entrenched himself firmly in power. During his reign and those of his immediate successors the country enjoyed remarkable prosperity, and attained to a high degree of civilization. In 1340 the House of Roman died out, and soon after Galicia and Lodomeria came under

the sway of Casimir the Great of Poland, and except for an interval of a decade and a half (1370-86) formed a part of Poland till the first partition of that country in 1772. In that year the territory of Galicia, under the title of the Kingdom of Galicia and Lodomeria, was annexed by Austria, whose portion was increased in 1795 by the addition of West or New Galicia. Austria was forced in 1809 to cede West Galicia to the Grand Duchy of Warsaw, and in 1810 a portion of East Galicia to Russia, but it recovered possession of the latter in 1814, while the former remained in the hands of Russia, with the exception of a fragment which was erected into the Republic of Cracow. In 1846 the Republic of Cracow, which had become the centre of the Polish revolutionary movement, was suppressed and handed over to Austria, which incorporated it with the crownland of Galicia. The period since 1848 has been marked by a fierce struggle between the Polish and Ruthenian nationalities, the former seeming to retain their almost absolute ascendancy, and the latter striving to win their share of political rights, and a voice in the government. Consult Jandaurek, *Das Königreich Galizien* (Vienna, 1884).

GALICIA, *Span. pron. gá-lê-thé-à*. A political division of Spain, bounded on the north by the Atlantic, on the east by the provinces of Asturias and León, on the south by Portugal, and on the west by the Atlantic (Map: Spain, A 1). Area, 11,254 square miles. The surface is generally composed of numerous isolated mountains and hills intermingled with valleys and elevated plains, but there are few connected mountain chains. The chief river is the Minho. The climate is moist but not unhealthful. In some districts the soil is fertile and well cultivated. Agriculture and stock-raising are the leading industries. Minerals are found in the mountains, and the waters along the coasts abound in fish. The unequal distribution of land and the backwardness of the manufacturing industries are responsible for the impoverished state of the masses, and the constant stream of emigration to Portugal and the more progressive parts of Spain, as well as to North and South America. Population, in 1887, 1,894,558; in 1900, 1,980,515. The inhabitants are called *Gallegos*, and resemble the Portuguese rather than the Spaniards, speaking a distinct dialect. Administratively, Galicia is divided into the four provinces of Corunna, Lugo, Orense, and Pontevedra. The seat of the Captain-General is Corunna.

Galicia was originally occupied by a tribe known as the Callaici or Gallaici, whence the name of the region. It was first subjugated by the Romans in the time of Augustus. Early in the fifth century, when the torrent of Suevi and Vandals swept across the Pyrenees, Galicia, which then included old Castile, was occupied by the former. After remaining independent for almost two centuries, it became part of the Visigothic kingdom under Leogovild in the latter part of the sixth century. At the time of the Saracen invasion, great numbers of the Visigoths fled thither. The Saracens were driven out in 734 by Alfonso the Catholic of Asturias. Galicia shared the fortunes of Asturias and of León, and finally became part of the Kingdom of Castile. On the death of Ferdinand the Great of Castile and León, in 1065, it formed for a few years an independent kingdom under his son Garcia.

GALIGNANI, gǎ'lě-nyǎ'né. A family of European publishers, of whom the most prominent were GIOVANNI ANTONIO (1752-1821) and his sons JOHN ANTHONY (1790-1873) and WILLIAM (1798-1882). For a time the father, a native of Brescia, lived in London, where his sons were born, but, removing to Paris, founded there an English library, an English *Monthly Repository*, and began in 1814 the publication of *Galignani's Messenger*. This paper, continued by the sons, was published under the old title till a few years ago, but is now known as simply the *Messenger*. At Corbeil the brothers set up a hospital for needy Englishmen, and in 1889, at Neuilly, the Galignani Home for distressed printers.

GALILEE. See PALESTINE.

GALILEE. The name applied in England to a porch or chapel placed near the entrance to a church, beyond which women were not permitted to pass. In abbeys, for example, the monks came to the Galilee to see their female relatives. The term Galilee Porch was also used. The name is supposed to have been suggested by Mark xvi. 7: "He goeth before you into Galilee: there shall ye see him," said to have been quoted by the monks in ushering into the Galilee the women who thus visited the abbey. A portion of the nave was sometimes marked off by a step, or, as at Durham, by a line of blue marble to mark the boundary within which women were not permitted to pass. There are fine specimens of galilees at the cathedrals of Lincoln, Ely, and Durham, and the name is also applied to the little library in the central arch of the west end of Peterborough Cathedral.

GALILEE, SEA OF. See GENNESARET, LAKE OF.

GALILEI, gǎ'lě-lá'è, VINCENZO (c.1533-c.1600). An Italian musician and mathematician. He was born at Florence, and was the father of Galileo Galilei, the astronomer. As a composer, he is chiefly important for his songs with lute accompaniment, which are generally regarded as introducing the monody subsequently adopted by Peri, Caccini, etc., the accredited founders of the *opera in musica*. More valuable are his writings, the most important of which are a polemical discourse on the works of Zarlino of Chioggia (1589), and the treatise *Il Fronimo, dialogo sopra l'arte del bene intavolare e rettamente suonare la musica* (1583). He was an accomplished lute-player and violinist, and a prominent member of the historic coterie of artists whose rendezvous was the house of Count Bardi. His death occurred at Florence.

GALILEO, gǎ'lě-lá'ò, **GALILEO GALILEI**, gǎ'lě-lá'è (1564-1642). An Italian physicist and astronomer, one of the founders of modern experimental science. He was born in Pisa, in February, 1564, of a Florentine family more ancient than opulent. By desire of his father, a mathematician of considerable ability, he directed his early studies to medicine and the prevailing Aristotelian philosophy, the dogmas of which he soon came to disbelieve. Later, however, while still at the University of Pisa, he devoted himself to the study of mathematics and physical science. At the age of eighteen he made one of his most important discoveries. Happening on one occasion to observe, in the Cathedral of Pisa, the oscillation of a lamp casually set in motion, he was struck with

the apparent measured regularity of its vibrations; and having tested the correctness of this observation by comparing the beat of his own pulse with the action of the pendulum, he concluded that by means of this equality of oscillation a simple pendulum might become an agent in the exact measurement of time. This discovery he subsequently utilized by the successful application of the pendulum in constructing a clock for astronomical purposes. His bias toward mechanical construction and experimental science received a new impulse from his intercourse with a friend of his father's, Ostilio Riccio, who consented to give him systematic instruction in pure mathematics. Such was Galileo's absorption and delight in his new studies that his father at length sanctioned his abandonment of the art of medicine, in order that he might concentrate his powers on his chosen sciences. The first fruit of his geometrical investigations was the invention of a hydrostatic balance, by which the specific gravity of solid bodies might be ascertained with great accuracy. In 1589, the fame of Galileo's extraordinary learning having reached the Grand Duke of Tuscany, he was appointed professor of mathematics in the University of Pisa. About this period he turned his attention to the then very imperfectly comprehended laws of bodies in motion; and in opposition to accepted notions, he propounded the theorem that all falling bodies, great or small, descend with equal velocity. This soon led him to the discovery of the law regulating the motion of falling bodies, which was proved correct by experiments made from the summit of the leaning tower of Pisa, greatly to the chagrin of the Aristotelians, whose enmity to Galileo had now grown more decided. In consequence, he relinquished his chair at Pisa, and retired to Padua, where, in 1592, he accepted the invitation of the Venetian Senate to lecture on mathematics in the university for the space of six years. It is also said, however, that Galileo lost his chair at Pisa, from having ridiculed the mechanical pretensions of Giovanni de' Medici, son of Cosimo I. Galileo's engagement at Padua was eventually prolonged to the term of eighteen years; but so urgent was his desire to return to his birthplace, that he sought a restoration to his former post at Pisa, and was gratified by an assent being accorded by Cosimo II., with exemption from any but a voluntary exercise of the duties of professorship. During his sojourn at Padua, his course of lectures enjoyed extraordinary popularity; crowds of pupils flocked to hear him from all parts of Europe; and he was the first to adapt the Italian idiom to philosophical instruction. Among his various discoveries may be noticed a species of thermometer, a proportional compass or sector, and, more important than all, the construction of the refracting telescope for astronomical investigation. In 1609 he offered his first complete telescope to the Doge of Venice, Leonardi Deodati, by whom it was tested from the tower of Saint Mark. In the same year he constructed a microscope; and then commenced his astronomical researches by means of his own telescope. He speedily concluded that the moon, instead of being a self-luminous and perfectly smooth sphere, owed her illumination to reflection, and presented an unequal surface deeply furrowed by valleys and mountains of great extent. The Milky Way he pronounced a

tract of countless separate stars; and these discoveries were crowned by a still more important series of observations, which led to the discovery of the four satellites of Jupiter on the night of January 7, 1610 (though it was not till the 13th of the same month that he came to the conclusion that they were satellites, and not fixed stars), which he named the Medicean stars. He also was the first to note movable spots on the disk of the sun, from which he inferred the rotation of that orb. He returned to Tuscany in 1610, where renewed quarrels with the Aristotelians disquieted and embittered his existence. In 1611 he visited Rome and was received with great distinction, being enrolled a member of the Lincei Academy; but four years later, on a second visit, his reception was widely different, as by that time, in his work on the solar spots, he had openly advocated the Copernican system, and was in consequence denounced as a propounder of heretical views. He repaired again to Rome, to demand an experimental inquiry into the soundness of his views; but the Grand Duke, apprehending Inquisitorial dangers for his favorite, summoned him back to Tuscany; at the same time the Pope, through the famous Cardinal Bellarmine (a sincere friend of Galileo's), commanded him to abstain from all future advocacy of heretical doctrines. Some time after, Galileo wrote his most famous work in the form of a dialogue between three fictitious interlocutors, the one in favor of the Copernican system, the second an advocate of the Ptolemaic, and the third a satirical personage who begins by agreeing with the Ptolemaic arguer, but usually ends by being convinced by the Copernican, and then assists in belaboring poor Simplicio, the supporter of Ptolemaic motion. In 1630 Galileo contrived to obtain the Papal *imprimatur*, which was subsequently revoked; but having got a similar authorization at Florence, he published, in 1632, this exposition of his opinions under the title of *Un dialogo intorno i due massimi sistemi del mondo*. Hardly had the work been issued, when it was given over to the jurisdiction of the Inquisition. Pope Urban VIII., previously Cardinal Barberini, and until now a friend and eulogist of Galileo, was led to believe that Galileo had satirized him in this work under the name of Simplicio, as one who is careless about scientific truth, and who timidly adheres to the saws of antiquity. On September 23, 1632, Galileo was cited to appear for the second time before the Inquisition. During his protracted trial he was allowed to reside as a prisoner in the house of the Tuscan ambassador. His judges condemned him to abjure his scientific theory. This he did. That he was actually put to the torture is now no longer a question open to dispute, though it is true he was threatened with it. His famous whisper, *E pur si muove* ("But nevertheless it does move"), is a fiction. Galileo was sentenced to an indefinite term of imprisonment by the Inquisition, which was soon commuted by Pope Urban, at the request of Ferdinand, the Grand Duke of Tuscany, into permission to reside at Siena, and finally at Florence, should the prisoner's health require the change. In his retreat at Arcetri he continued his researches, even when hearing grew enfeebled and sight was extinguished. He died on January 8, 1642, at the age of seventy-eight, and was interred by ducal

orders in the Cathedral of Santa Croce, where a majestic monument symbolizes his great achievements.

Galileo's disposition was truly genial; he enjoyed with keenness the social wit and banter of his friends, and the pleasures of the banquet; and the readiness with which he offered or accepted atonement modified a somewhat irascible disposition. The great deficiencies in his character were a want of tact to keep out of difficulties, and a want of moral courage to defend himself when involved in them. His biting, satirical turn, more than his scientific tenets, was the cause of his misfortunes. Galileo was of small stature, but of a robust and healthy frame; his countenance was attractive, and his conversation cheerful. He loved art, and cultivated especially music and poetry. His style is nervous, flowing, and elegant.

We may briefly recapitulate Galileo's most important contributions to physical science under the following heads: (1) The relation between space and time in the case of falling bodies; (2) the path of projectiles is a parabola; (3) the isochronism of the pendulum; (4) the partial discovery that suction is owing to the pressure of the atmosphere; (5) the re-invention of Aristotle's theory respecting sound; (6) the invention of the telescope; (7) the discovery of the satellites of Jupiter, phases of Venus, and spots on the sun. For the nature of these discoveries, see PENDULUM; FALLING BODIES; PROJECTILES; etc.

The best edition of Galileo's collected works is that by Alberi (16 vols., Florence, 1842-56). Consult: Viviani, *Life of Galileo* (Lausanne, 1793); Brewster, *The Martyrs of Science, or the Lives of Galileo, Tycho Brahe, and Kepler* (London, 1846); Chasles, *Galileo Galilei* (Paris, 1862); Cebler, *Galileo und die römische Curie* (Stuttgart, 1876); Berti, *Copernico e il vicende del sistema Copernicano, and Il processo originale di Galileo* (Rome, 1876); Rossi, *Del metodo Galileiano* (Bologna, 1817); Favaro, *Galileo Galilei* (Florence, 1882); Scartazzini, *Galileo Galilei* (Milan, 1883); Wegg-Prosser, *Galileo and His Judges* (Eng. trans. London, 1889); Günther, *Geisteshelden*, vol. xxii. (Berlin, 1896).

GALIMBERTI, gä'läm-bär'tè, LUIGI (1836-96). A Roman Catholic ecclesiastic and diplomat, born in Rome, where he was educated in both law and theology. He taught theology in the College of the Propaganda, and at the University of Rome, and in 1868 was appointed Canon of the Lateran. By Leo XIII. he was made secretary of the congregation of extraordinary ecclesiastical affairs, Canon of Saint Peter's at Rome, and Archbishop of Nicæa. He was sent on various embassies, and was the author of the award which the Pope as arbitrator made in favor of Spain, in her contention with Germany for the sovereignty over the Caroline Islands. When, as a result of the struggle of Bismarck against the power of the Catholic Church in Germany (Kulturkampf), the relations between the Papacy and the German Empire were broken off, it was Galimberti who was sent in 1880 on a mission to Germany, with the result that the oppressive 'May Laws' of 1872 were abrogated. In 1887 he represented the Papacy at Vienna, and here also was fortunate in securing a satisfactory settlement of long-standing differences between the Vatican and Austria-Hungary. In 1893 he

returned to Rome, and was made a cardinal and precept of the Papal Archives.

GAL/INGALE (*Cyperus longus*). See **CYPERUS**.

GAL/ION. A city in Crawford County, Ohio, 80 miles southwest of Cleveland; on the Cleveland, Cincinnati, Chicago and Saint Louis and the Erie railroads (Map: Ohio, E 4). It is primarily a manufacturing and railroad town, with railroad-shops, several carriage-factories, brick and tile plants, wheel, wagon, and gear works, lumber-mills, and a foundry. Galion was laid out in 1831, and was chartered as a city in 1878. Its government is administered by a mayor, elected biennially, and a unicameral council. The city owns and operates the electric-light plant. Population, in 1890, 6326; in 1900, 7282.

GALITZIN. See **GOLITZIN**.

GAL/UM. See **BEDSTRAW**.

GALL, gäl, FRANZ JOSEPH (1758-1828). The founder of phrenology, born at Tiefenbronn, Baden. He studied medicine at Strassburg and Vienna, and settled in the latter place as a practicing physician. He became known by the publication of his *Philosophisch-medizinische Untersuchungen über Natur und Kunst im gesunden und kranken Zustande des Menschen* (1791). But he acquired a much more extensive reputation by his lectures on the structure and functions of the brain, which he began to deliver in 1796. His views were so subversive of received doctrines on the subject of mind that the lectures were prohibited in 1802 by the Austrian Government. Along with his pupil, Spurzheim (q.v.), who became his associate in 1804, Gall quitted Vienna in 1805, and during his travels through Germany, Holland, Sweden, and Switzerland, expounded his views in many of the universities and principal cities. In 1807 he settled as a physician in Paris, and there began lecturing and writing for the propagation of his opinions. On March 14, 1808, he and Spurzheim presented to the Institute of France a memoir of their discoveries, on which a committee of the members of that body (including Pinel, Portal, and Cuvier) drew up an unfavorable report. Gall and Spurzheim thereupon published their memoir, with a reply to the report, in a volume entitled *Recherches sur le système nerveux en général et sur celui du cerveau en particulier* (1809). This was followed by their larger work, *Anatomie et physiologie du système nerveux* (1810-19), with an atlas of 100 plates; but the two phrenologists having parted in 1813, the name of Gall alone is prefixed to volumes iii. and iv., and it alone is borne by a reprint of the physiological portion of the work, entitled *Sur les fonctions du cerveau, et sur celles de chacune de ses parties* (1825). In answer to accusations of materialism and fatalism brought against his system, Gall had early published a part of the work under the title *Des dispositions innées de l'âme et de l'esprit* (1812). He continued to practice medicine and pursue his researches at Montrouge till his death. For a discussion of his ideas, see **PHRENOLOGY**.

GALL, LUISE VON. See **SCHÜCKING**, **LEVIN**.

GALL, SAINT. See **SAINT GALL**.

GAL/LAGHER, WILLIAM DAVIS (1808-94). An American journalist and poet, born in Philadelphia, Pa. He was the son of an Irish patriot

implicated in the Rebellion of 1798. While he was still a child his family removed to Ohio, where he learned the printer's trade, and later contributed to country newspapers. In 1828 he settled in Cincinnati, and this city, with brief changes of residence, was his home for many years. He edited several journals, particularly the *Mirror* and the *Hesperian*. Much of the verse and prose which appeared in these publications was contributed by the best American writers of the day, and he constantly wrote for them himself. He next became connected with the Cincinnati *Gazette*. Upon his removal to Louisville, Ky., in 1852, he began another paper, the *Courier*, which failed. During the Civil War he was in the employ of the Treasury Department, and subsequently was a pension agent and farmer in Kentucky. Gallagher was most influential in promoting literary interests in the West. His poetical works include *Errato* (3 vols., 1835-37), containing "The Wreck of the Hornet," and *Miami Woods* (1881).

GALLAIT, ga'lä', LOUIS (1810-87). A Belgian historical painter. He was born at Tournai, studied there under the classicist Hennequin and, afterwards, under van Brée at Antwerp. His "Tribute to Cæsar" (1830) and "Christ Healing the Blind" (1833) were purchased by subscription for the Cathedral of Tournai. At Paris he came under the influence of Delaroche and produced many works such as "Montaigne Visiting Tasso in Prison" (1836) for the Belgian King, the "Capture of Antioch by Godfrey de Bouillon" (Versailles), and other historical subjects for the French Government, and, finally, his "Abdication of Charles V." (1841, Brussels Museum). Exhibited in Germany, where it profoundly influenced native art, this last work brought him the highest honors. He was called by the Government to Brussels, where he founded an influential school of historical painting. His work shows taste and judgment, but the technique is eclectic and his presentation theatrical. Other celebrated subjects are: "Last Honors to Egmont and Hoorne" (1851, Tournai), "Last Moments of Egmont" (1858, Berlin), and the "Plague at Tournai" (1882, Brussels). His once famous portraits and genre subjects are less important. Consult Henne, in *Annales de l'académie de Belgique* (Brussels, 1890), and Dujardin, *L'art flamand* (ib., 1899).

GALLAND, ga'län', ANTOINE (1646-1715). A French Orientalist and numismatist, born at Rollot, near Montdidier, in Picardy. After finishing his course at the Lycée, he studied Oriental languages at the Collège de France. In 1670 he accompanied the French Ambassador De Nointel to Constantinople, and made two subsequent trips to the East in the interest of science, collecting a large number of inscriptions, etc. In 1701 he was made a member of the Académie des Inscriptions, and in 1709 professor of Arabic in the Collège de France. The greater part of Galland's writings relate to numismatics and the East; but what secured for him a lasting reputation was his translation of the *Arabian Nights*, in twelve volumes (*Mille et une nuits; contes arabes*, 1704-17). This was the first translation of these stories ever made into any European language, and so little was known about them in Europe that Galland got the credit

of being himself the author as well as the translator. The translation led not only to the popularity, but also to critical investigations, of the remarkable collection. (See ARABIAN NIGHTS.) Among his other writings may be mentioned: *Paroles remarquables, bons mots, et maximes des Orientaux* (1694), and *Les contes et fables indiennes de Bidpai et de Lokman* (1724). His numismatic and archaeological writings will be found chiefly in the *Journal des Savants*, and the *Mémoires* of the Académie des Inscriptions et Belles-Lettres.

GALLA OX, or **SUNGA**. See **HUMPED CATTLE**.

GALLARATE, gäl'là-rä'tà. A city in North Italy, 25 miles northwest of Milan, with a technical school and important cotton factories (Map: Italy, C 2). Population of commune, in 1881, 8400; in 1901, 12,000.

GALLAS, or **OROMA** (*Gallas*, Conquerors; *Ilm'-orma*, Sons of the Brave). An Ethiopian people in Eastern Africa, south of the Abyssinian plateau, numbering 6,000,000, and occupying 400,000 square miles of territory. They represent the purest type of the Ethiopian branch of the Hamitic race, called Kushito-Hamites. Keane divides these Ethiopian peoples into Somali Hamites, Galla Hamites, Afar (Domakil) Hamites, Abyssinian (Agao) Hamites, Semitized and mixed Hamites, Himyaritic (Abyssinian) Semites, Arab (nomad) Semites, Negroes, and Bantus. He pronounces the Gallas to be the finest people in all Africa—tall, shapely, with high, broad foreheads and handsome faces. Their color is chocolate, the hair black and kinky. They are a pastoral and agricultural people; but their common dangers and mutual jealousies have made them warlike. They are divided into tribes and petty kingdoms, having two social classes—the aristocratic *prutuma* ('herdsmen') and the plebeian *argatta* or *kutto* ('tillers'). They are all more or less subject to the Negus Negusti of Abyssinia. In religion they are pagans, Mohammedans, and Sidamas—that is, members of the Abyssinian Christian Church. Consult A. H. Keane, in Stanford's *Africa*, vol. i. (London, 1895), where all the tribal subdivisions are given, with their exact locations.

GALLAS, gäl'làs, Count **MATHIAS**, Duke of Lucera (1584-1647). A German general in the Thirty Years' War, born in Trent. After serving as a mercenary in the armies of Spain and Savoy, he became colonel of an infantry regiment in the army of the Catholic League, and afterwards became one of Wallenstein's most trusted officers. For his services at the taking of Mantua (1630), in the War of the Mantuary Succession, he was created a count. He commanded the right wing of Wallenstein's army at the battles of Nuremberg and Lützen. From selfish motives he opposed Wallenstein, intrigued against him at Vienna, and after his assassination, in accordance with promises made him, he succeeded to his command. He won the decisive battle of Nördlingen over Bernhard of Weimar, in 1634; but after varying successes and failures in the four following years he was succeeded as commander-in-chief, in 1638, by the Archduke Leopold. After Leopold's defeat by Torstenson and the Swedes at the second battle of Breitenfeld, in 1642, Gallas was again placed in command, but was defeated in Holstein and again superseded. He succeeded

Hatzfeld as commander-in-chief after the latter's defeat at Jankau, but soon fell ill and was compelled to retire.

GALLATIN. A city and the county-seat of Daviess County, Mo., 75 miles northeast of Kansas City, on the Grand River, and on the Wabash and the Chicago, Rock Island and Pacific railroads (Map: Missouri, C 2). It has a trade in lumber, grain, live stock, etc., and is the centre of an agricultural district, with valuable timberlands. Population, in 1890, 1489; in 1900, 1780.

GALLATIN. A town and the county-seat of Sumner County, Tenn., 26 miles northeast of Nashville; on the Louisville and Nashville and the Chesapeake and Nashville railroads (Map: Tennessee, E 4). It is the seat of the Howard Female College, opened in 1836. The town is surrounded by a fertile agricultural region, and manufactures flour, spokes, etc. The water-works and electric-light plant are owned by the municipality. Population, in 1890, 2078; in 1900, 2409.

GALLATIN, ALBERT (1761-1849). One of the most distinguished of American public financiers. He was born in Geneva, Switzerland, January 29, 1761, and graduated at the Academy of Geneva in 1779. In 1780 he and a friend, Henri Serre, came to the United States, and spent a year at Machias, Me., in trade pursuits, with little success. Gallatin then moved to Boston, where he supported himself by teaching French, and in July, 1782, received permission to give instruction at Harvard College. In the following year he explored, and invested in, lands on the western frontier, and in 1784 established a country store in Fayette County, Pa., near the Virginian boundary. He was in 1789 a delegate to the State Constitutional Convention, and in 1790, as also in the two following years, he was sent to the Legislature by Fayette County, where he was conspicuously active in opposition to the Federal excise law, and where, also, the basis of his reputation was made by his report of the Committee of Ways and Means in the session of 1790-91. In February, 1793, he was elected to the United States Senate, and took his seat on December 2d; but in the following February the Senate decided, by a party vote of 14 to 12, that he did not possess the proper qualifications as to citizenship, it having been less than nine years, the time prescribed by the Constitution, since he had taken the oath of citizenship and allegiance to the State of Virginia. Gallatin was active at the time of the Whisky Insurrection (q.v.), and although he urged submission to law and the refraining from all improper and illegal acts, nevertheless he went so far in his relations with the insurrectionists as to give himself, both then and later, considerable political embarrassment. He was, at the end of the trouble, elected to the Pennsylvania Assembly, and from 1795 to 1801 was a member of Congress, where he allied himself with those Republicans who, under the leadership of Madison, were opposing the administration of the Federalists. "In his first term," says his biographer, Stevens, "he asserted his point and took his place in the councils of the party. In his second, he became its acknowledged chief. In the third, he led its forces to final victory."

He served on important committees, and stead-

fastly opposed the administration, especially in the matter of the Jay Treaty, the increase of the army and navy, and the relations with France. Particularly did he attack the administration of the finances, a field with which his pamphlets showed him to be familiar, and his services and abilities in this direction were recognized by Jefferson, who in 1801 made him Secretary of the Treasury, a post which he held until 1813. During these years a marked reduction was effected in the national debt, the practice as to appropriations was made more systematic, the sinking-fund system was improved, and the preparations were made which rendered a war and an increase of the national debt possible without a disorganization of the public financial system. Gallatin also rendered important service in the negotiations which were concluded by the Treaty of Ghent (q.v.). Of his services in this connection, one of his biographers, Henry Adams, has said: "Far more than contemporaries ever supposed or than is now imagined, the Treaty of Ghent was the especial work and the peculiar triumph of Mr. Gallatin." Thereafter, declining both a nomination to Congress and an opportunity to resume charge of the Treasury Department, he became Minister to France, filling the post from 1816 to 1823. Three years later he went to London as Minister, remaining one year, and concluding two important conventions. He had been nominated for the Vice-Presidency by the Crawford Republicans in May, 1824, but withdrew in October to make room for Clay, and in 1843 he declined to enter Tyler's Cabinet as Secretary of the Treasury.

After the conclusion of his diplomatic service he removed to New York (in 1828), and that city remained his permanent residence until his death. He was president of the National Bank there for some years; but the duties were light, and he had ample time for study and public service. He was much interested in the problems of public education and of finance, and took an active part in the movement which resulted in the founding of New York University; but his chief interest appears to have been in the study of ethnology, especially of American ethnology. He founded the American Ethnological Society in 1842, which for a brief period was a very serviceable agency for the promotion of such studies, and he wrote several valuable essays and monographs on ethnological subjects. He did not lose his interest in finance and in history, however, and in every way gave an example of scholarship and of public spirit rarely surpassed by any one in this country.

He was twice married, first, in 1789, to Sophie Allègre, who died within a few months, and then, in 1793, to Hannah Nicholson, daughter of Commodore James Nicholson, whose death shortly preceded his own. He died August 12, 1849, at Astoria, L. I. He published in 1796 a *Sketch of the Finances of the United States*, and in 1843 memoirs on the *American Rights to the North-eastern Frontier*, and many minor essays on finance, history, and ethnology, his *Synopsis of the Indian Tribes Within the United States, East of the Rocky Mountains, and in the British and Russian Possessions in North America* (1836), and his *Notes on the Semi-Civilized Nations of Mexico, Yucatan, and Central America, with Conjectures on the Origin of Semi-*

Civilization in America (1845), being especially noteworthy. His *Writings*, which are of great value in the study of the political history of the United States in the first part of the nineteenth century, have been edited by Henry Adams (3 vols., Philadelphia, 1879). Consult: Adams, *Life of Albert Gallatin* (Philadelphia, 1879), and Stevens, *Albert Gallatin*, "American Statesmen Series" (Boston, 1884).

GALLAUDET, gál'la-dét', EDWARD MINER (1837—). An American educator of the deaf and dumb, son of Thomas Hopkins Gallaudet. He was born in Hartford, Conn., and was educated at Trinity College in that place. In 1856 he became a teacher in the institution for the deaf and dumb which his father had founded at Hartford, and the year following, at the instance of Amos Kendall, removed with his mother, Sophia Fowler Gallaudet, to Washington, where they organized and took charge of an institution similar to that at Hartford, known as the Columbian Institution. In 1864 he was one of the founders of the National Deaf-Mute College at Washington, of which he became president. In 1867-68 he made an extended tour of Europe, visiting the principal institutions for the deaf and dumb, and publishing on his return the results of his investigations in a full and extremely valuable report. In 1880 he was a delegate to the international congress of instructors of deaf mutes, held in Milan, Italy, and in 1883 was president of the convention of American instructors of deaf-mutes at Jacksonville, Ill. At the request of the British Government, he went to England in 1886 and gave information on American methods of teaching the blind, deaf, and dumb, before a royal commission appointed to investigate and reorganize the system in England. His publications include: *A Popular Manual of International Law* (1879), and *Life of Thomas Hopkins Gallaudet* (1888), his father.

GALLAUDET, THOMAS (1822-1902). An American clergyman and educator of the deaf and dumb, a son of Thomas Hopkins Gallaudet (q.v.). He was born in Hartford, Conn., and graduated at Trinity College (Hartford) in 1842. In the following year he became a teacher in the Institution for the Deaf and Dumb in New York City, which position he held for fifteen years. Meanwhile he was ordained a deacon and priest in the Protestant Episcopal Church, and in 1852 he organized Saint Anne's Episcopal Church in New York, in which service was provided for deaf mutes. In 1872 he organized and became general manager of the Church Mission for the Deaf and Dumb, and in 1885 founded the Gallaudet Home for Deaf Mutes at Poughkeepsie. He was chosen rector emeritus of Saint Matthew's Episcopal Church and vicar of Saint Anne's, which since 1897 has been associated with Saint Matthew's Parish, and is used exclusively as a place of worship for deaf mutes.

GALLAUDET, THOMAS HOPKINS (1787-1851). An American educator of the deaf and dumb, born in Philadelphia, Pa., of French Huguenot ancestry. He graduated at Yale in 1805, and after pursuing theological studies at the Andover Theological Seminary, was licensed to preach in 1814. Instead of preaching, however, he went to Europe in 1815, to study the existing methods of caring for the deaf and

dumb, familiarizing himself with the systems of the Abbé Sicard in Paris, and of Braidwood and Watson in London. In 1817, with Laurent Clerc, a deaf-mute assistant of Sicard, he opened a school of instruction at Hartford, Conn., of which he continued to act as principal until 1830. He published, in addition to numerous pamphlets: *Sermons Preached to an English Congregation in Paris* (1818); *Bible Stories for the Young* (1838); *The Child's Book of the Soul* (1850). Consult: Humphrey, *Life* (New York, 1858), and E. M. Gallaudet (his son), *Life* (New York, 1888).

GALL-BLADDER. See LIVER.

GALLE, gál. See POINT DE GALLE.

GALLE, ANDRÉ (1761-1844). A French engraver and medalist, born at Saint-Etienne. His most famous medals commemorate the conquest of Upper Egypt, the capitulation of Vienna, the battle of Friedland (1807), the battle of Wagram (1809), and the marriage of the Duke de Berry. He also engraved vignettes for banknotes, and the plates for a series of stamps for Government use.

GALLE, gál'le, JOHANN GOTTFRIED (1812-). A German astronomer, born at Pabsthaus, near Gräfenhainichen. He studied the mathematical sciences at Berlin, taught for a time in a gymnasium, and was subsequently made assistant observer in the Berlin Observatory, of which Encke was then director. He discovered three unexpected comets, and was awarded the prize of the French Academy. But his principal achievement was the finding of the planet Neptune. It was to the Berlin Observatory that Leverrier addressed his request that a search be made for the hypothetical planet, whose place in the sky he had computed from the observed disturbances in the motion of Uranus. Galle made the search requested by Leverrier, and was the first to see the new planet, September 23, 1846. Galle was also perhaps the first astronomer to advocate (1875) the use of planetoid observations for the determination of the solar parallax (see PARALLAX)—a method now considered the best known. His researches on this subject were published at Breslau, where he had been made director of the observatory and professor of astronomy in 1851. Galle's published works include: *Grundzüge der schlesischen Klimatologie* (1857); *Ueber die Verbesserung der Planetenelemente* (1858); *Ueber die Bestimmung der Sonnenparallaxe* (1875); *Mitteilungen der Breslauer Sternwarte* (1879); *Verzeichnis der bisher berechneten Kometenbahnen* (1894). His original contributions were published, for the most part, in scientific periodicals.

GALL/LEOT. See GALLIOT.

GALLEGO, gá-lyá'gó, JUAN NICASIO (1777-1853). A Spanish poet, born at Zamora. He took orders in 1800, and became court chaplain in 1805. On the uprising of 1808 he wrote what is probably his best-known poem, "Al dos de Mayo," a stirring patriotic ode. After the restoration of Ferdinand VII. he was imprisoned for three years, but the Revolution of 1820 set him at liberty. He became the perpetual secretary of the Spanish Academy. His works are few, but hold a high place in the literature of his country, on account of their excellent style

and intense patriotism. A posthumous edition of his *Obras poeticas* was published in 1856.

GALLENGA, gál-lép'gá, ANTONIO (1810-95). An Italian historian and publicist, born at Parma. He began the study of medicine at the University of Parma, but soon abandoned it for a literary career. After the insurrection of 1831, in which he played a part, he had to go into exile, and visited France and the United States. Returning to Italy, he became prominent in the councils of Mazzini's party, and was chosen as the agent to assassinate the King of Sardinia, Charles Albert. He could not bring himself to the performance of this cowardly deed, and in 1838 withdrew to London. In 1843 he was given the chair of Italian literature in University College, and three years later he became a naturalized British citizen. In Italy again on the uprising of 1848, he left it when the fortunes of the revolutionists sank, only to return in 1854, when he was elected a Deputy to the Sardinian Parliament. The following year he had his *History of Piedmont* published at London, and aroused such dissensions in Mazzini's party by his frank statement of facts as to the intended assassination of Charles Albert that he had to resign his place in the Parliament. He returned to Italy in 1858, reentered the Parliament at Turin as a Deputy, and in 1874 he accompanied King Victor Emmanuel to Berlin and Vienna. He was long a correspondent of the *London Times* both in Italy and in other countries, including America, Denmark, and Spain. In addition to the *History of Piedmont*, he wrote, among other works: *Oltremonte ed oltremare, canti di un pellegrino* (1844); *Italy, Past and Present* (1846); *Scenes of Italian Life* (1850); *Italy in 1848* (1851); *Two Years of the Eastern Question* (1877); *The Pope and the King* (1878); *L'Italia presente e futura* (1886). His *Practical Grammar of Italian* for the use of English-speaking students has passed through many editions since 1851. He contributed many articles to English reviews.

GAL/LEON (from Sp. *galcón*, It. *galeone*, augmentative of *galea*, galley). A name formerly applied to ships of war of three or four gun-decks, but subsequently transferred to the large merchant vessels which every year brought to Spain the gold, silver, and other wealth contributed by its Mexican and South American colonies. They were armed, but being heavy, unmanageable vessels, and containing cargoes of immense value, were eagerly sought after as prizes whenever a war broke out.

GALLERY (OF. *gallerie*, *galerie*, Fr. *galerie*; probably a special use of OF. *gallerie*, *galeric*, mirth, from *gale*, festivity, from AS. *gal*, OHG., Ger. *geil*, wanton). A word with several applications in architecture. (1) A long open structure in the upper part of a building, whether projecting or not, inside or outside; (2) a long passage, a corridor or narrow hall connecting other apartments; (3) a large, well-lighted, long hall for exhibiting collections of paintings, sculptures, and other works of art; (4) a large structure, usually of glass, used for public purposes, shops, etc. Of class (1) interesting examples are, for outside galleries, the famous outside façade galleries on French Gothic cathedrals, such as the *galerie des rois* at Rheims, Amiens,

and Paris, usually serving as a practical passage-way; for inside galleries, the second-story galleries in so many mediæval churches, often termed triforium galleries, the projecting roof-lofts, or singing galleries, extending across the inside façade, and the projecting galleries in many modern churches, theatres, opera-houses, etc. The arrangement of galleries in tiers one over the other, now so much used in churches, theatres, etc., is entirely modern, dating from the seventeenth century. Of class (2) early and most interesting instances are the low and richly paneled gallery-halls of the old châteaux and manor houses, especially in English mansions of the sixteenth and seventeenth centuries, where family portraits and collections of arms, armor, furniture, and bric-à-brac were kept; but even more strictly to it belong such galleries as the Bridge of Sighs, in Venice, or the gallery of the Sainte Chapelle and of the Palais de Justice in Paris, connecting two buildings together. Here should be mentioned such long galleries as those connecting the Pitti Palace and the Palazzo Vecchio. Class (3) is related to the *château* gallery, being a hall largely for public instead of private exhibition, but differs fundamentally in having the name applied to the entire building containing the several exhibition galleries. We are familiar with the Uffizi, Borghese, Louvre, National, and other such galleries. Finally, to class (4) belong the very modern and colossal glass galleries at Naples and Milan and those of the Palais Royal and some of the German cities, which are in reality streets roofed with glass. Some galleries can hardly be classified, such as the famous Gallery of Mirrors at Versailles.

GALLERY. In military fortifications, a covered passage, cut through the earth or masonry in the defenses, whereby effective musketry fire can be directed through loopholes. Galleries have been occasionally used in the counterscarps of dry ditches, enabling the defenders to maintain a flanking fire upon the ditch. They are also used in the construction of military mines, and form an important part of fortresses like Gibraltar, where there are galleries of communication and connection. See FORTIFICATION; MINES AND MINING, MILITARY.

GALLEY (OF. *galce*, *galie*, It. *galea*, from ML. *galea*, *galcia*, Grk. *γαλέα*, *galca*, *γαλαῖα*, *galaia*, galley). The name generally applied to vessels using sails and oars. The ships of the ancients were practically all of this character, hence they are generally spoken of as galleys. A bas-relief at Thebes represents a naval victory gained by the Egyptians over the East Indians about B.C. 1400. The vessels shown have oars and sails, and the Egyptians had figureheads of metal in the shape of a lion's head. Herodotus says that the Egyptian war galleys had soldiers on board as the fighting force, archers and sling-men being stationed on the raised platforms at bow and stern, while pikes, spears, javelins, battle-axes, falchions, swords, and other weapons were kept in convenient places for use in boarding or repelling boarders. The sail was square and carried on a yard on the single mast. The Egyptians never were such bold navigators as the Phœnicians, and their vessels were probably inferior in sea-going qualities to the Phœnician ships. After having been for centuries masters of the seas, the Phœni-

cians became subject to Egypt, and in B.C. 610, by order of the Egyptian King, Necho, a Phœnician expedition is said to have circumnavigated Africa. The advantages possessed by a war vessel propelled by oars over one at the mercy of the winds was early realized, and to attain the greatest possible speed the number of banks of oars was increased to two, three, four, and five. The increase beyond three seems to have resulted in very little gain, and the *trireme* remained for many centuries the standard type of war galley of the first class. In merchant galleys sails formed the principal motive device, and oars were auxiliary; in war galleys the reverse was the case.

The more modern galley appeared after sail-power had begun to assert its supremacy as the propelling force of sea-going vessels. Its development reached its highest point at the end of the sixteenth century, Lepanto being the last great sea fight in which the galley appeared as the most powerful type of war-ship. These vessels carried firearms, guns, and small arms, and had fairly good sail-power as well as oars. During the Middle Ages the oars of galleys were largely manned by infidel prisoners and criminals, and in France convicts were used in the large boats working about the arsenals until recent times. Row-galleys, fitted as gunboats, were extensively used during the Napoleonic wars in operations, and caused much trouble to the British fleet. Like all galleys designed especially for oar-propulsion, they were long and narrow, the length being seven or eight times the beam, and they were, therefore, very fast. In the British Navy the term galley is applied to the captain's boat, or gig, and other similar boats built for speed under oars. For further information, consult: Duemichen, *Die Flotte einer ägyptischen Koenigin*, etc. (Leipzig, 1868), Eng. trans., *Fleet of an Egyptian Queen*; Rawlinson, *Ancient Monarchies* (London, 1862-76); Parker, *Fleets of the World: The Galley Period* (New York, 1877); Chabas, *Etudes sur l'antiquité historique* (Paris, 1873); Jal, *Archéologie navale* (Paris, 1840); Bouet-Willamez, *Batailles de terre et de mer* (Paris, 1855). See SHIPS.

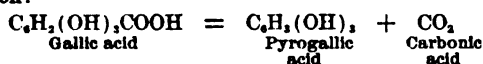
GALLEY SLAVE. See BAGNES.

GALL-GNAT. A minute fly of the family Cecidomyiidae, which makes galls (q.v.) on plants.

GALLIARD, gá'yär' (Fr., merry). An old French dance for two dancers. It was of a stately character, written in three-quarter time, and was one of the precursors of the minuet.

GALLIC ACID (from Lat. *galla*, gall-nut), $C_6H_7(OH)_2COOH$. An organic acid that exists ready-formed in small quantity in gall-nuts, in tea, in valonia (the acorn-cup of *Quercus agilops*), in divi-divi (the pod of *Casalpina coriaria*), in sumac, and in other vegetable products. It is formed from tannin when the latter is boiled with dilute sulphuric or hydrochloric acid, or, much more slowly, when gall-nuts, reduced to a thin paste with water, are exposed to the air. Gallic acid has also been prepared artificially by chemical methods. It may be purified by dissolving in hot water, decolorizing the solution with animal charcoal, and setting it away to crystallize. Pure gallic acid is a colorless substance, crystallizing in the form of silky needles that are slightly soluble in cold water, but require

only three parts of hot water for their solution, and are also freely soluble in alcohol and in ether. When heated to the temperature of 220° C., gallic acid melts and decomposes into pyrogallic and carbonic acids, the reaction taking place according to the following chemical equation:



Solutions of gallic acid have an acid reaction and a sour, astringent taste; iron salts impart to them a blue-black color, and, therefore, gallic acid has been employed in the manufacture of ink. Further, as the acid possesses the property of reducing the salts of gold, silver, and platinum, it has been extensively employed in developing photographs. Gallic acid is also sometimes used in medicine; and finally, since solutions of its alkali salts rapidly absorb oxygen, the acid may be usefully employed in the chemical laboratory.

GALLICAN CHURCH. The National Church of France. The term is frequently used, however, not so much in its historical or geographical sense as in the narrower signification attached to the word Gallicanism—a school of thought which asserts certain principles of more or less independent Church government and prerogatives in administration claimed by the National Church as opposed to certain rights of the Pope. The fact that France was the 'eldest daughter of the Church,' one of the countries in which the Christian faith became widely diffused even in the lifetime of the Apostles, gave the adherents of this view a powerful tradition of Church privileges to which they might appeal. Christianity flourished very early among the Greek colonies in the south of Gaul, as the old tradition of the visit of Lazarus to this region attests. In the numerous and populous towns along the Rhone and its tributaries, there arose important congregations professing Christianity. When persecution came, the Gallic Christians had their full share of hardships. They were closely in touch with those who shared the same faith in other parts of the world, and one of the most touching monuments of early Christian literature is the letter of the churches of Lyons and Vienne to the brethren in Asia concerning the martyrs of these churches, which Eusebius has preserved in his *Ecclesiastical History*. The works of Irenæus, Bishop of Lyons (died c.202), are important contributions to the history of Christian doctrine. In the next two centuries Sulpicius Severus, Hilary of Poitiers, Hilary of Arles, Vincent of Lérins, Prosper, Victor, Eucherius, Salvian, and Gregory of Tours continued a tradition of great churchmen, of which Gaul was not without reason proud. The hierarchical organization of the Church of Gaul was, from the earliest times, the most complete and regular of all Western Christendom. As a result of this tradition of zeal and faith, many privileges were granted to it, and later on, the kings of France began to make themselves more and more felt in ecclesiastical affairs. This was an almost inevitable consequence of the close relations between the Crown and the Church dignitaries, most of whom held the temporalities of their benefices by the ordinary feudal tenure; the royal authority soon came to assert a correlative claim to certain privileges in ecclesiastical matters.

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There were not wanting ecclesiastics who would compound with their consciences in order to uphold the claims of their sovereign, and for several centuries after the death of Charlemagne, kings and bishops at times played into each other's hands.

In order to secure subservient ecclesiastics, monarchs insisted on the privilege of nominating to bishoprics. The wealth of the more prominent sees was very great, and rulers contrived at times to have their brothers, or even illegitimate relatives, nominated to them. Where such unworthy prelates ruled their flocks without due regard to Church principles, the only resort was an appeal to Rome; and that usually took a considerable time, during which abuses seemed to acquire the force of right. As the result of these appeals and their not infrequent decision against the wish of the King, there came a protest against having such causes decided outside the realm. More than one of the French sovereigns engaged in a conflict with the Roman See; and these conflicts naturally called out a division of opinion among the members of the Church of France, one party supporting the Papal claims, while the other maintained the alleged prerogatives of the French Crown and privileges of the National Church. The great contest between Philip the Fair and Boniface VIII. was a turning-point in the constitutional history of Europe—the beginning of a reaction on the part of the laity against ecclesiastical predominance, which, like most reactions, went further in the opposite direction; and the State succeeded in transferring to itself the greater part of the external dominion enjoyed previously by the hierarchy.

Gradually the principles of what is known as Gallicanism took definite shape, even thus early. Throughout its long career, while recognizing in theory the primacy by divine right of the Roman pontiff over the whole Church, it yet asserted the independence of national churches, and especially that of France, in many details of local government, and held the exercise of Papal prerogative to be limited by the canons and decrees of general councils. It must be added that while the Gallican theory to this extent claims an exemption from dependence upon the authority of the Pope, it acquiesces, on the other hand, to an almost proportionate degree in the assumption of ecclesiastical authority by the civil government; indeed, in many of the details of its later development it falls into the extremest form of Erastianism, the doctrine of State supremacy in matters spiritual as well as temporal. The conflicting claims of the rival popes in the Western schism (see **SCHISM, WESTERN**) tended to weaken the Papal authority, especially in France. The expedient adopted of calling a general council to pronounce upon the respective claims of the rival popes gave prominence to what became one of the leading tenets of Gallicanism, the superiority in point of authority of the general council to the Pope.

Some of the disciplinary enactments of the councils of Constance (1414-18) and Basel (1431-45) were mainly directed toward the limitation of the Papal authority in the exercise of Church patronage within the limits of the National Church. These claims of privilege culminated in the Pragmatic Sanction (q.v.), passed at

Bourges in 1438 by a national council of the French Church in union with the King, Charles VII. This abolished Papal reservations, and restricted appeals to Rome to *causæ maiores*. Though Louis XI. attempted to repeal it, it was maintained in spite of Papal protests until 1516, when it was superseded by the Concordat of Bologna (see CONCORDAT) between Leo X. and Francis I. The most conspicuous alteration effected by the new compromise was the transfer of the right of nomination to bishoprics and other *benefices consistoriaux* from the capitular bodies to the Crown, with a provision for Papal veto upon any choice which did not satisfy canonical requirements. It was substantially a triumph of the absolutist principle, as represented by the King and the Pope, over the constitutional, as embodied in the 'Gallican liberties'; the upholders of the latter quoted it complacently as establishing them, whereas it was the most formidable blow which had been dealt at them.

Soon, however, new and more far-reaching complications arose with the introduction of the principles of the Reformation into France. The first Protestant place of worship in Paris was opened in 1555, at which time the adherents of the Reformation in the kingdom probably numbered about a million and a half. Beginning as dissenters on spiritual grounds, the Huguenots were soon driven by the force of circumstances into the position of a seditious faction whose activity threatened the peace and stability of the State. Their history cannot be properly understood unless this fact is borne in mind. The story of the wars of religion is strangely complicated by its bearing upon their progress. Thus the League, which took its rise from the strangely indulgent terms granted to the Huguenots by the 'Peace of Monsieur' in April, 1576, four years after the massacre of Saint Bartholomew (see BARTHOLOMEW'S, MASSACRE OF SAINT), was founded upon peculiarly assorted principles; politically it was democratic, while its religious views were the most ultramontane. At the time of its predominance, after the 'day of the barricades' (May 12, 1588), the Huguenots became for a time the champions of order and constitutional authority; but the situation changed again with the conversion of Henry IV. That sovereign, when he issued the Edict of Nantes in 1598, was actuated not only by a general belief in toleration, but by his knowledge that French Protestantism was a struggle even more for political than for religious predominance, and his desire to bring that conflict to an end, in the interests of statesmanship, by depriving his Protestant subjects of any reasonable pretext for disaffection.

With the cessation of civil strife, a remarkable outburst of religious life manifested itself. There was need for it; three-fourths of the parochial churches and a third of the episcopal sees were without pastors, and miserable disorder was to be seen everywhere. Now, in all directions, new undertakings multiplied—colleges, schools, hospitals, congregations for the systematic training of the clergy, seminaries, and new monastic orders or reforms within the old ones. The names of Saint Vincent de Paul, of Saint Francis de Sales, and his devoted associate, Saint Jane Frances de Chantal, of Cardinal de Bérulle, and M. Olier—of La Trappe and Saint-Maur and Port Royal—speak eloquently of the great wave of

zeal which passed over the land in the first half of the seventeenth century. When, however, the death of Richelieu removed the great personality which had stood for order and unity, this fair picture was marred by a new ebullition of strife, which proved full of peril and disaster, in the rise of Jansenism and Quietism (qq.v.). Toward the close of the century, moreover, with the attempt of Louis XIV. to enlarge the ecclesiastical prerogative of the Crown as he had increased its political authority, the principles of Gallicanism assumed an importance which may fitly be treated here at length. Controversy arose over his attempt to enforce the so-called *droit de régale*, based upon his claim to receive the revenues of bishoprics during vacancies, and to appoint to all benefices in the bishop's patronage, not involving the cure of souls, which might fall vacant during the interval. An effort to exercise this power brought on a collision between the Crown and certain bishops. Their metropolitan decided against them, and they appealed to Rome, where Innocent XI. upheld them, much to the displeasure of Louis and the courtier ecclesiastics. An assembly of the higher French clergy was convened to find a way out of the difficulty. At its opening Bossuet, just chosen Bishop of Meaux, delivered his celebrated discourse on the unity of the Church. It was clear that his intention was not to deny the headship of Rome in any sense, but merely to reassert what were considered prescriptive privileges; yet it is difficult to understand how the prelate who pronounced so eloquent a defense of the rights of the Pope could, before the end of the assembly, have signed the Gallican articles.

These articles, four in number, are considered the charter of Gallicanism. The first declares that "the jurisdiction of Saint Peter and his successors in the Roman see as vicars of Christ on earth, although divinely bestowed, is confined to things spiritual, and does not extend to civil or temporal affairs." The second renews the declaration of the Council of Constance as to the superiority of a general council to the Pope, and declares that the articles passed in the third and fourth sessions of the council are not to be restricted in their application to a period of schism such as existed at the time of the council. The third asserts that the authority of the Pope is to be restricted by the canons of the universal Church, and that "the laws, customs, and constitutions of the realm and of the Gallican Church remain in full force." The fourth declares that "the Pope has the principal share in the decision of questions of faith; his decrees regard all the churches and each church in particular; nevertheless, his judgment is not irrevocable unless the consent of the entire Church be added to it." It has been pointed out that since the Vatican Council, adherence to this last proposition would amount, for Roman Catholics, to formal heresy. The chief laws and customs referred to in the third article are that the National Church of France is not bound to receive all the decrees of councils and of popes in matters of discipline, and that only such decrees as are formally received are in force in France; that the Gallican Church holds itself free to receive or reject the rules of the Roman Chancery; that the Roman Pontiff cannot levy any impost upon the French clergy without their consent;

that he cannot bestow of his own motion on a foreigner any benefice properly belonging to the Gallican Church; that neither the Pope himself, nor his legates, can hear French causes 'in the first instance,' and that even in cases of appeal he is bound to assign French judges to hear the cause, even should the appellant be a metropolitan or primate; finally, it is asserted that the French bishops shall not be required to attend any general council, unless with the permission of the Crown. The last of these customs, as also those which make the reception of the general canons of discipline optional in France, and which practically throw the decision into the hands of the civil power, have been not unreasonably called the 'slaveries' rather than the 'liberties' of the Gallican Church. It was not long before Bossuet declared that "the liberties of the Church are constantly appealed to against the Church and to her detriment." Fénelon wrote: "In practice the King of France is now more the head of the Church than the Pope. Liberty toward the Pope; servitude toward the King. The King's power over the Church has fallen into the hands of the civil tribunal. Laymen lord it over the bishops. Secular judges go so far as to examine even those Papal bulls which relate only to matters of faith."

Louis was resolved, nevertheless, to enforce the declarations strenuously. By royal edict he commanded the acceptance of the four articles and their incorporation into the acts of parliaments and universities. Professors were required to teach them and bishops to swear to them. The Sorbonne objected, but was compelled to submit. Outside of France, distinct disapproval marked the declaration; Pope Innocent XI. received it in silence, but refused to raise to the episcopate any members of the assembly who were subsequently nominated. His successor, Alexander VIII., condemned the declaration in 1690. Two years later Louis wrote to Innocent XII. that his edict concerning the Declaration of Rights no longer held, and that he wished all the world to recognize his veneration for the Pope. The declaration was not, however, formally withdrawn, and was subsequently condemned by Clement XI. in 1706, and again by Pius VI. in 1794.

The revocation of the Edict of Nantes scarcely belongs in strictness to an ecclesiastical survey, since, like the original promulgation, it was supposed to be an act of political wisdom. The Huguenots, as Lavalée remarks, preserved toward the Government the attitude of children in disgrace, and toward the Catholics that of disdainful enemies; they persisted in their isolation; they kept up a continual correspondence with their friends in England and Holland, even when those countries were hostile to their own. "France," says Michelet, "found a Holland in its own bosom which was rejoicing at the success of the other." On the eve of the formation of the League of Augsburg against him, Louis XIV. could hardly have been expected to leave such a stronghold of anarchy within his kingdom as the privileges of the Edict of Nantes had come to constitute. The act of revocation was received with a chorus of enthusiastic applause from all sorts of people in France. Bossuet burst forth into a joyful panegyric: Fénelon, who has been represented as the apostle of toleration, laid it down clearly that "though no sovereign may re-

quire interior belief in religious matters from his subjects, he may prevent the public exercise, or the profession, of opinions or ceremonies which disturb the peace of the commonwealth, by the diversity and multiplicity of sects." The laity applauded the King not less than the clergy; the great Chancellor, Le Tellier, after a life of noble and high-minded service to his country, died with the *Nunc dimittis* upon his lips, saying that he had nothing left to wish for after this final act of his long ministry. The consequences to religion were not, however, altogether happy; and the gentle methods of persuasion employed by the Lazarists, Sulpicians, Doctrinaires, and Theatines, who went as missionaries among the Huguenots, were probably far more efficacious in producing real conversions than were the *dragonnades*.

The general tone of laxity which characterized the eighteenth century did not fail to have its effect upon the Church, infecting at least the higher clergy with a spirit of worldliness and selfish devotion to ease and pleasure. A terrible punishment came upon them in the Revolution. The Constituent Assembly first laid hands upon the property of the Church to meet its financial needs, and then assumed to tamper with her organic structure. The 'Civil Constitution of the Clergy,' decreed on July 12, 1790, was but a natural outcome of Gallican principles; yet its arbitrary suppression of dioceses and establishment of others, its provision for the election of bishops and *curés* by the people and their payment by the State, whose stipendiaries they were to become, raised the weightier question as to whether, after all, the civil power was to impose laws upon the spiritual without the concurrence of its legitimate rulers. From this time Gallicanism, as a system, has steadily declined; and while it is true that French bishops in the nineteenth century have been, as a rule, less ultramontane than others, they seem to have learned the necessity for the supremacy of the head of their Church in religious matters. In fact, since the Vatican Council, it may be said that Gallicanism as a factor in French Church history has almost entirely disappeared.

The attempt just mentioned of the Constituent Assembly to separate the French Church from Rome, and to make it a mere department of the newly organized State, brought about a condition of affairs very like a schism. Those who submitted to take the oath to support the new order of things, the Constitutional clergy as they were called, were regarded by the stricter Catholics as having forfeited their rights, and in the more conservative provinces, like Brittany, the people refused to attend their ministrations. On the other hand, those who refused the oath were subjected to increasingly heavy penalties by the Revolutionary Government, and either exiled as a last resort to the pestilential swamps of Guiana or executed. Their faithfulness, however, had its reward; when religion once more held up its head after the excesses of the Terror, the Constitutional organization gradually disappeared; and a *modus vivendi* was reached in the Concordat of 1801 by Napoleon, who was acute enough to see the advantage to his newly founded dynasty of the support of the Church. This, having proved not entirely satisfactory, was reviewed after the Restoration, in 1817; but the

new instrument, which was in many particulars a return to that of 1516, was not approved by the Chambers, and the Church remained for several years uneasily fluctuating between two concordats, neither of which was fully executed, until in 1822 an arrangement was concluded by which thirty prelates were added to the existing hierarchy, its total number being thus fixed at eighty.

Among questions or movements of general significance which have agitated the French Church since that date must be mentioned the stir caused about 1830 by the body of enthusiastic visionaries, of whom Lamennais, Lacordaire, and Montalembert are the best known, starting from a pure devotion to the cause of liberty and a conviction that the Church would gain by its fullest exercise, but ending in dangerous errors which received the condemnation of the Holy See, and in more modern times the very serious aggressions made upon the Church with increasing bitterness by the Government of the Third Republic. Though Pope Leo XIII. has repeatedly laid down the principle that there is no reason why, theoretically, a good Catholic should not be a good republican, it is undeniable that the bulk of the monarchist parties is composed of members of the Church; and it is, therefore, not altogether to be wondered at that the Government has felt justified in taking a position of antagonism to the Church as a whole. The extreme lengths, however, to which this antagonism has been carried within the last few years are difficult to reconcile with the principles of a democracy, and afford scope for many doubts as to the outcome of a policy so hostile to the religious instincts which are at least latent in the great majority of the French population.

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GALLICAN CONFESSION. See GALLICAN CHURCH.

GALLIEN, gāl'lén, JOHANNA. See WYTTEBACH, DANIEL ALBERT.

GALLIENUS, gāl'lī-ē'nūs, ARCH OF. An arch at Rome in honor of Gallienus and his wife Salonina. It represents the old Esquiline gate of the Servian city, converted into a travertine arch by Aurelius Victor.

GALLIENUS, PUBLIUS LICINIUS (? A.D. 268). Roman Emperor, A.D. 253-268. The son of the Emperor Valerianus, he was made joint

ruler on his father's accession in August, 253. In 256 he took the field against the Alemanni, who were making incursions into the Roman provinces along the Danube. After several campaigns they were subdued in 258, but they rose again soon after and forced their way into Italy, where Gallienus gained a victory over them near Milan. (See ALEMANNI.) Meanwhile Valerianus had been engaged in wars with Sapor, the Persian King, by whom he was taken prisoner in 260. Gallienus now became sole Emperor, but only in name; for self-appointed rulers arose in all parts of the Empire, this period being for that reason known in history as the 'Reign of the Thirty Tyrants.' Gaul became practically a separate kingdom under Postumus (258-267). With civil war within and constant incursions of the barbarians from without, the reign of Gallienus was a period of incessant turmoil until, in an attack on Milan, where he was besieging the usurper Aureolus, he was killed in a plot formed by some of his own officers (March 4, 268).

GALLIETFET, gā'l'ē'fā, GASTON ALEXANDRE AUGUSTE, Marquis de (1830—). A French soldier, born in Paris. He fought in the Crimean War on the staff of General Bosquet, and was commended for his bravery at Sebastopol. He was subsequently engaged in Mexico, and was dangerously wounded at the battle of Puebla (May 15, 1863). In recognition of his bravery he was selected upon his return to France to deliver the captured Mexican battle-flags to Napoleon III. During the Franco-German War he led the memorable cavalry charge at the battle of Sedan, and afterwards became conspicuous in the suppression of the Commune. In 1872-73 he was in Algeria, where he suppressed the revolt among the natives. In 1875 he became general of division, and in spite of his Bonapartist and clerical proclivities, avowed himself a loyal republican, and won the favor of Gambetta. In 1879 he was appointed commander of the Ninth Army Corps, and did much to improve the French cavalry. In 1899 he was appointed Minister of War, which position he resigned in 1900, after having by his rigorous discipline done much to carry the Government safely through the crisis of the Dreyfus agitation. He is considered one of the leading authorities in Europe on cavalry tactics.

GALLINÆ (Lat. nom. pl. hens), or RASORES. An order of birds, more generally valuable to man than any other order, containing at once the most important species domesticated as poultry, and those most sought after as game. The common domestic fowl may be regarded as the type of the order. Like it, the Gallinæ in general have a small head; a rather short bill, with the upper mandible a little arched; nostrils placed on the sides of the bill, and usually in a soft membranous space at its base; the figure bulky; the wings short, and not governed by powerful muscles, or adapted for long or rapid flight; the feet with three toes before, and one behind—which is articulated higher than the others, and is sometimes wanting—adapted for walking on the ground and for scraping, which is much resorted to, in order to procure food and for other purposes; the digestive organs are complex, the crop is large, the gizzard very muscular, the intestine long, with two very large cæca. The sternum is deeply double-notched; there are two carotids; the oil-gland is tufted; the plumage

has aftershafts and there are usually more than twelve tail-feathers. The head, at least of the males, is often furnished with appendages, as a crest, comb, wattles, etc. The feet of the males are also often furnished with *spurs*, and at least during the breeding season the males are very quarrelsome. The males of many species (e.g. pheasants) are birds of splendid plumage; that of the females is sober, but females of very advanced age often assume a plumage similar to that of the males. Some of the Gallinæ are polygamous, some pair at the breeding season; the nest of all of them is artless, and the males take no part in incubation, or in the rearing of the young. The young are precocial, that is, they are comparatively feathered when hatched, and are immediately able to run about and pick up food for themselves, but are for some time tended and protected by the mother, and by her the proper food is sought for them and pointed out to them, or broken into sufficiently small pieces, and laid before them. The Gallinæ have unmelodious voices. Except the curassows, they make their nests on the ground. Some of them are found in almost all parts of the world. Besides those already named; guans, pheasants, grouse, partridges, quails, ptarmigans, peacocks, turkeys, guinea-fowls, and tragopans may be mentioned as examples of this order. See ORNITHOLOGY; FOWL; GROUSE; PARTRIDGE; PEACOCK; EGGS OF AMERICAN WATER AND GAME BIRDS, for colored plates and further description.

GALLINETA (Sp., sandpiper). A remarkable rail (*Aramides ypecaha*) of the La Plata Valley, South America, called 'ypecaha' by the native Indians, which is noted for its shrieking cries, and for its gathering into companies which join in dances, the performers becoming almost frenzied with excitement, and with loud cries and outstretched wings rushing from side to side for several minutes. These performances seem to be unconnected with the nuptial season or sexual excitement, and are indulged in by jacanas, the Cayenne lapwing, and various birds in other parts of the world. For a detailed description and consideration of this and other habits, consult Hudson, *Naturalist on the La Plata* (London, 1892).

GALLINGER, JACOB H. (1837—). An American physician and politician, born at Cornwall, Ontario, Canada. He graduated at the medical school of Dartmouth College in 1858, practiced medicine and surgery at Concord, N. H., from 1862 until his appearance in public life, and contributed much to medical literature. In 1879-80 he was Surgeon-General of New Hampshire, with rank of brigadier-general. He was a member of the New Hampshire House of Representatives in 1872-73, of the State Senate in 1878, 1879, and 1880, and again of the House in 1891. From 1882 until his resignation in 1890 he was chairman of the Republican State Committee, and in 1898 and 1900 was reelected to the post. He was chairman of the New Hampshire delegation to the Republican National Convention of 1888, in which he seconded the nomination of Benjamin Harrison for the Presidency, and also to that of 1900. In 1885 he was elected to the Federal House in the Forty-ninth Congress. He was reelected in the Fiftieth, declined renomination for the Fifty-first, took his seat in the Senate in 1891, and was reelected in 1897.

GALL-INSECTS (from Lat. *galla*, gall-nut). Until about two hundred years ago galls were supposed to be purely of vegetable origin, and the maggots that grow within them were supposed to arise by spontaneous generation in the organic substances in the galls. Pliny knew that a fly came from galls, and thought they grew like fungi in the night. Malpighi, in the second half of the seventeenth century, was the first to record the fact that the production of galls followed puncture of vegetable tissue by insects, and he came to the conclusion that the insects inject a substance, which he called ichor, into the plant-tissue, and this substance produced a swelling similar to that which the sting of a bee causes in animal tissue. Réaumur held the theory that the gall is not the product of some specific irritating fluid, but is due to the irritation caused by the prick, and to the presence of the egg and developing larvæ in the tissue. Some galls begin to develop as soon as the eggs are laid, but, unfortunately for the universal application of Réaumur's theory, others do not begin to develop until after the eggs hatch, which may be months after they are deposited in the tissue.

Galls occur on a great many kinds of plants and are produced by a variety of insects, by mites, and by at least one nematode worm. Each species of insect confines its activities to one or, at the very most, to a very limited number of species of plants. The same kind of insect will produce different kinds of galls on different kinds of plants, and different kinds of insects will produce different kinds of galls on the same plant. Each species of gall-insect, however, infests different parts of the plant, such as the leaf, flower, stem, or root, and that part alone; and it produces there galls with such precise qualities that it can be definitely stated, from the appearance of the gall, what sort of an insect has caused its development. In rearing galls, one cannot be certain from merely observing the emerging insects what species are the producers of the gall, for a number of different kinds of insects may develop within the same gall, some as guests, feeding on the tissue of the gall, and others as parasites on the larvæ of the true gall-insect.

Nearly all the orders of insects have gall-making representatives. In addition there are the galls of mites and nematodes. The galls made by mites, like those produced by plant-lice, have open mouths for the escape of the matured mites. An example of a gall produced by mites is the pear-leaf blister made by *Phytoptus pyri*. Nematodes of the genus *Anguillula*, which is allied to the vinegar-worm, are the cause of smut in growing grain, particularly in wheat. The larvæ of these insects have the most extraordinary capacity of withstanding desiccation. The egg is laid by the parent in the growing ear, where the larvæ develop and are set free by the dying grain. They then live in the moist earth until the young wheat begins to grow. They creep up the stem of the wheat, and when once lodged within the head they soon gain sexual maturity. In their wanderings in search of new, growing grain, the larvæ undergo great vicissitudes. They may be compelled by drought to encyst a number of times, even on the very stem of the plant, and await moisture before they are able to reach their final destination. Accord-

ing to Spallanzani, they may retain their vitality for twenty years while awaiting their food-plant.

The family Cynipidæ, of the order Hymenoptera, furnishes the greatest number of species of gall-producing insects. The majority of its species (called gall-flies) infest some part of the oak, making closed galls. They are the best studied of all the galls, and a large amount of information concerning their life history has been gained by the painstaking studies of Adler, Riley, and others. Adler kept oak saplings until from four to six years old, and on these he isolated certain insects, and observed the resulting galls. Some of the species that Adler bred were so nearly alike that he could determine them with certainty only by their galls. Moreover, certain species that had been given different specific or even generic names he found to be the alternating generations of other described species. Some winged generations he found to be composed entirely of females, and the next generation of both males and females. Thus the individuals of one generation do not resemble their parents, but their grandparents. (See ALTERNATION OF GENERATIONS.) Not only are the insects of these two generations very different, but the galls that they produce are likewise different. Other forms are believed to reproduce entirely parthenogenetically without males ever appearing. Adler studied galls of the bud, leaf, bark, and root, and found that all of them are developed by abnormal activities of the cambium ring. The potentialities of the tissue-growth are always present at the spot pricked, and are merely called into activity by the prick or by the larvæ. He found that some of the galls are protected from attack by sweet juices, which attract guarding ants, and it is interesting to note that the honey-making ants (q.v.) of the Southeastern United States gather honey from oak-galls. Other galls are provided with a sticky secretion on long hairs which entraps marauders; the spongy parenchyma of some galls is so very thick that it acts as an effectual barrier against intruders. Other galls have an inner stony layer for the protection of the larvæ; others, a large, hollow chamber in which it is difficult for the enemy from without to locate the larvæ. The pine-cone-like arrangement of scales in certain galls is a sufficient protection to the larvæ. Other galls are exempt from attack by virtue of their bitter tannin or by their protective coloration. Insects, titmice, pheasants, and squirrels are the chief enemies of gall-insects, the birds and squirrels tearing them open in winter to get the larvæ within them.

Three classes of hymenopterous insects may be reared from one and the same gall. (1) Psenids, or true gall-flies, which lay their eggs in the tissue of the plant; many of these species cause those subsequent modifications in the development of the plant-tissue that we call galls. (2) Inquilines, or guests, which lay their eggs and develop in the galls caused by the true gall-makers. (3) Parasites, which prey on the larvæ of the true gall-makers or their guests. According to Adler, Riley, and others, the growth of the gall probably depends upon the activity of the larvæ, and is the result of some secretion or excretion thrown out by the larvæ.

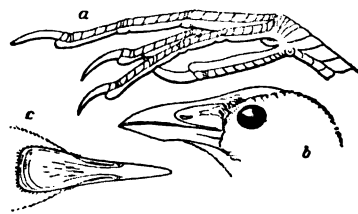
The rate of growth of the gall will depend on that of the meristem, those that are formed on

catkins and young leaves growing rapidly, while those on roots and bark require perhaps months to gain full size.

Some of the gall larvæ of the Diptera (especially the minute flies of the family Cecidomyiidae) transform in the plant tissue and others in the ground. The larvæ are maggot-like and without anal opening. The goldenrod gall, a round ball produced in the stem of the plant by a fly (*Trypeta solidaginis*), and the pine-cone galls on the heart-leaved willow (*Salix cordata*) are formed by dipterous insects. The Hessian fly of wheat, which stings the base of the leaf, and the wheat-midge, which stings the flower, are also classed as gall-insects. The Hemiptera have gall-producing representatives among the plant-lice (aphids) of the Coccidæ and of Phylloxera. The galls produced by plant-lice have open mouths for the escape of the developed lice. Reproduction may take place within the gall. The cockscomb elm-galls, on the upper side of elm-leaves, are produced by a plant-louse (*Colopha ulmicola*). The destructive grape-vine phylloxera makes galls on the under side of the grape-leaf and on the roots of the vine. The elongated galls on the goldenrod stems are produced by a tineid moth (*Gelechia gallæsolidaginis*). In Australia several plants are infested by gall-producing thrips, and galls are also said to be caused by beetles.

Consult: Osten Sacken, "On the Cynipidæ of North American Oaks and Their Galls," in *Proceedings of the Entomological Society of Philadelphia*, vol. i., pp. 47 to 72, 241 to 259; and vol. ii., pp. 33 to 49; vol. iv., pp. 331 to 380 (Philadelphia, 1861-64); Cameron, *Monograph of the British Phytophagous Hymenoptera* (London, 1882-93); Rothman, "On the Ætiology and Life History of Some Vegetal Galls," in *Natural Science*, vol. iii. (London, 1893). Beutenmüller, "Catalogue of Gall-Producing Insects Found Within Fifty Miles of New York," in *Bulletin of the American Museum of Natural History*, vol. iv. (New York, 1892—). See PHYLLOXERA; APHID.

GALLINULE (Lat. *gallinula*, diminutive of *gallina*, hen). A bird of one or other of the genera *Gallinula*, *Iornis*, etc., of the family Rallidæ, closely allied to the coots, and having the upper mandible similarly extending up on the



HEAD AND FOOT OF GALLINULE.

a, foot of purple gallinule (*Iornis Martinica*); b, profile of head of the same; c, top of head of Florida gallinule (*Gallinula galeata*), showing shape and extent of frontal shield.

forehead in a naked soft plate, but the toes usually furnished with an undivided narrow marginal membrane. This membrane and the great length of the toes enable the gallinules to swim well, and all of them are aquatic. The species are about 30 in number, some of them confined to tropical regions. Two occur in the United States. The Florida gallinule (*Gallinula galeata*) is brownish olive above, grayish black beneath, and

the bill is red. It is a little more than a foot in length, and is found from New York State, Minnesota, and California southward through Central and Northern South America, though only a summer visitor in the most of the United States. Its nesting habits are like those of the coot (q.v.). The purple gallinule (*Tornis Martinica*) is a trifle smaller, and a handsome olive green above, the head and under parts being a beautiful purplish blue. It is a South and Central American species, common to the West Indies and the South Atlantic States, where it is resident. (See Plate of RAILS, ETC.) All these birds are commonly known as 'mud-hens,' and are shot for sport, but the flesh is not good.

The common gallinule (*Gallinula chloropus*) of Europe is more usually styled in Great Britain 'water-hen,' or 'moor-hen.' It is widely diffused in the Old World, and abundant in suitable situations, such as river marshes and the artificial ponds of parks, where these birds may often be seen in considerable numbers, swimming together, with a peculiar nodding motion of the head. They seek their food both on the surface of the water and by diving, partly also among the grass of meadows and river-banks. A frequent jerking of the tail is very characteristic of them. When alarmed, they sometimes seek safety by flight, but more frequently by hiding among rushes or reeds. They make their nests near the water which they frequent, and usually on the ground, and lay from seven to ten brown and speckled eggs. The flesh is well flavored. See COOT and RAIL.

GALLIO, LUCIUS JUNIUS. A Roman rhetorician of the first century, a member of the senatorial order, who gained the ill will of Tiberius by proposing that retired members of the Prætorian Guard should have seats with the *equites* in the first fourteen rows of the theatre. He was banished from Rome, then recalled and kept under surveillance, and finally put to death by Nero. His text-book on rhetoric has not survived.

GALLIO, LUCIUS JUNIUS ANNÆUS. The name assumed by Marcus Annæus Novatus from that of Lucius Junius Gallio, the rhetorician, by whom, as a friend of his father, Marcus Annæus Seneca, he had been adopted. He was an older brother of the philosopher Lucius Annæus Seneca, and of the geographer Lucius Annæus Mela, father of the poet Lucan. It was quite probably through the influence of the former that, in the latter part of the reign of Claudius, Gallio was appointed Proconsul of Achaia, though his Hellenic culture was not an unlikely factor in the case. The exact date of this appointment is uncertain. It could not have been earlier than A.D. 44, in which year Achaia was raised to a senatorial province, and may have been as late as 54, the last year of Claudius's rule. If the office was in any way due to his brother's influence it must have been after 49, when Seneca, who had been in exile since 41, was recalled by Agrippina to become the tutor of Nero. We know definitely that Gallio was in office when Paul was at Corinth on his first visit to that city, but the exact date of this visit is debated, and varies between fall 49-spring 51 and fall 53-spring 55. See NEW TESTAMENT CHRONOLOGY.

It was during this visit that the Jews, angered evidently by the defection of leading members of the Synagogue to the Apostle's following, brought

Paul before the proconsul on the charge that he was acting contrary to the [Roman] law. Gallio dismissed their case, however, with the statement that he was not minded to be a judge of these matters. And when Sosthenes, probably the leader of the accusing party, was taken by the [Greek] bystanders, with whom the Jews were generally unpopular, and beaten before the judgment seat, Gallio refrained from interposing, the narrative stating that he cared for none of these things (Acts xviii. 14-17). From this last statement it has been inferred that Gallio was indifferent to Christianity. The words of his reply, however, while betraying an ignorance of the distinctive features of Christianity, disclose simply the usual attitude of Roman officials to the religions of the people of the provinces in accordance with Roman law. Its meaning is that, inasmuch as the controversy was practically a matter of religious dispute among the Jews, it should be adjudged by themselves, the Roman law taking no cognizance of such things. In accord with this it is clear that the statement referred to had reference merely to Gallio's indifference to the controversy in general and to the beating of Sosthenes in particular as matters of his judicial concern. Consult, besides the usual lives of Paul and commentaries on Acts, Ramsay, *Saint Paul the Traveler and Roman Citizen* (New York, 1896). See PAUL.

GALLIOT (from OF. *galiote*, from ML. *galeota*, diminutive of *galea*, galley). A galley of medium size having one mast and 16 to 20 oars, and very generally used in the sixteenth, seventeenth, and eighteenth centuries as a cargo vessel and gunboat by the maritime nations of Europe. Also a Dutch or Flemish vessel with very full lines, an easy bilge (q.v.), and a flat bottom. It is rigged like a ketch with a high mast stepped in the centre of the ship and a much lower one farther aft. The head-stays lead from the main (or higher) mast, and the head sails are large and numerous; both masts are square-rigged. Galliot are usually of 400 to 500 tons measurement. They were formerly much used as bomb vessels, the absence of a mast forward giving ample space for the operation of bombards, mortars, or howitzers.

GALLIPOLI, gál-lé'pó-lè. A city and seaport in the Province of Lecce, in South Italy, 55 miles south of Brindisi, the Greek name of which, Calipolis (beautiful city), was derived from its picturesque situation in the Gulf of Taranto, on a rocky island which a bridge having 12 spans now connects with the suburb of Lizza on the mainland (Map: Italy, M 7). Gallipoli has a cathedral dating from 1629, a castle, a seminary, a gymnasium, and a technical school. There is regular steamship communication with Brindisi and Taranto. It exports oil, wine, and fruit, and has long been famous for its oil-cisterns cut in the solid limestone. Population of commune, in 1881, 11,000; in 1901, 13,552.

GALLIPOLI (anc. *Callipolis*). A seaport of European Turkey, capital of a sanjak in the Vilayet of Adrianople, situated on the eastern coast of the peninsula of Gallipoli, at the north-eastern end of the Dardanelles (Map: Turkey in Europe, F 4). It has crooked, ill-paved streets, and is built mostly of wood. There are manufactures of leather, silk, and cotton, but the commercial importance of the town is on the decline, and

the well-fortified harbor has more strategical than commercial value. Gallipoli is a Turkish naval station, and the seat of a captain pasha and a Greek bishop. The population, largely Greek, is estimated at from 20,000 to 30,000. The town was of great commercial importance during the Middle Ages, and at one time had a population of 100,000. It suffered terribly at the hands of the Catalans early in the fourteenth century, and fell into the hands of the Turks in 1354, being the first Turkish possession in Europe.

GALLIPOLI, PENINSULA OF (the ancient Thracian Chersonesus). A portion of the Vilayet of Adrianople, European Turkey, separating the Strait of Dardanelles on the east from the Gulf of Saros on the west. It extends in a southwest direction for about 55 miles, and varies from 4 to 13 miles in breadth. The principal town on the peninsula is Gallipoli (q.v.).

GALLIPOLIS, gál'li-pó-lés'. A city and the county-seat of Gallia County, Ohio, 56 miles southeast of Chillicothe; on the Ohio River, and on the Toledo and Ohio Central, the Columbus, Hocking Valley and Toledo, and other railroads (Map: Ohio, F 8). It has a public library, a public park, and Gallia Academy. The city is surrounded by undeveloped coal-fields, and is a distributing centre of some importance. There are iron and wood-working industries, and manufactures of furniture, stoves, woollens, lumber, leather, etc. The government is administered by a mayor, elected every two years, and a city council. The water-works are owned and operated by the municipality. Population, in 1890, 4498; in 1900, 5432. Gallipolis was first settled in 1790 under the auspices of the Scioto Company, by a party of five hundred Frenchmen, who named it Gallipolis—the City of the Gauls. It was incorporated as a village in 1842, and in 1865 was chartered as a city. Consult *Centennial Anniversary of Gallipolis* (Columbus, 1891).

GALLISSONNIÈRE, gál'sò'nyâr', AUGUSTIN FÉLIX ELISABETH BARRIN, Comte de la (1742-1828). A French soldier. He was a nephew of Roland Michel Barrin, Marquis de la Gallissonnière, and was born at Anjou. He entered the navy while he was a boy, and served under his uncle in Canada; then he fought in the Hanoverian campaigns. In 1788 he was appointed field-marshal, and, just before the Revolution, was invested with the grand sword of Anjou, and was made president of the nobility in the States-General. When the Revolution came he was a Deputy to the Constituent Assembly, and on its dissolution refused to leave the country, but later became an *émigré* and fought under Condé. But in 1801 he returned to France and was elected Deputy in 1809. After the Restoration he fared equally well, being promoted to the rank of lieutenant-general, but soon retired. He wrote on the establishment of the National Guard, on the Constitution of 1789, on the freedom of the press, and many other contemporaneous topics.

GALLISSONNIÈRE, ROLAND MICHEL BARRIN, Marquis de la (1693-1756). A French naval officer and Governor-General of Canada, 1747-49. He was born at Rochefort, and at the age of seventeen entered the Royal Navy. In 1745, although only a captain in rank, he was appointed to the position of Governor-General of Canada to succeed Beauharnois. He reached Quebec in

1747, and during the two years he remained in Canada displayed not only great energy, but broad statesmanship. His plan for advancement of the French possessions in America provided for building a chain of forts in the Mississippi Valley to connect Louisiana and Canada, for settling ten thousand French peasants in the Ohio Valley to check the migration that was beginning to pour over the Alleghanies from the English colonies, and for winning the friendship and alliance of the Iroquois tribes. He succeeded in establishing some forts, and supported Abbé Piquet in his mission to the Iroquois country, but his request for new settlers remained unheeded. In 1749 he was recalled to France to act on the commission to fix the boundaries to be established under the Treaty of Aix-la-Chapelle, and was succeeded by the Marquis de la Jonquière. On his return to France he was made chief of the naval Bureau of Charts and Plans, in which position he organized several important scientific expeditions. In May, 1756, he defeated the English fleet under Admiral Byng off Minorca, a result which led to the court-martial and execution of the latter. Gallissonnière died the same year.

GALLITZIN, gál-lét'sén, DMITRI AUGUSTIN, Prince (1770-1841). An American Catholic priest, of Russian family. Born at The Hague, he received a Spartan training from his mother, who sent him to North America in 1792. The ostensible purpose of his journey was to study American life, and his observations led him to believe that the Catholic Church in the United States needed men, and to volunteer. He became a priest in 1795; was settled at Port Tobacco, Md., and then at Taneytown, Md.; but in 1799 he was transferred to Cambria County, Pa. He was dissatisfied with the American system of trustee control and limitation of the priestly power, and founded the Catholic town of Loretto, Cambria County, Pa., from which colonies went out to Saint Joseph, Saint Augustine, Pa., and Carrolltown, Pa. In his work Father Smith (as Gallitzin called himself until 1809, when he resumed his family name) spent much effort and a large fortune. In 1809, when Philadelphia was made a bishopric, Gallitzin was appointed Vicar-General of the outlying districts. His writings were mainly controversial. Consult Brownson, *Life of D. A. Gallitzin, Prince and Priest* (New York, 1873).

GALLIUM (Neo-Lat., from Lat. *Gallia*, Gaul, France). A metallic chemical element, discovered by Lecoq de Boisbaudran in 1875, by means of the spectroscope. Its properties had been previously (1870) predicted, from the periodic law (q.v.), by the Russian chemist Mendelëff, who gave it the provisional name of *eka-aluminum*. It is found in minute quantities in various zinc ores, and was originally discovered in the sphalerite of Pierrefitte, from which it may be obtained by dissolving the ore and decomposing the resulting solution by metallic zinc. The precipitate thus obtained contains gallium as a hydrated oxide, which is then further purified by repeated solution and precipitation, and the gallium finally thrown down in its metallic condition by zinc.

Gallium (symbol Ga; atomic weight, 69.9) is a fairly hard gray metal that may be hammered into thin plates which can be bent without break-

ing. It melts at 30.15° C. (about 86° F.), and has a specific gravity of 5.9 when solid. Its general properties are similar to those of the metal aluminum. Gallium combines with oxygen, forming a monoxide and a sesquioxide, and with chlorine to form a dichloride and a trichloride.

GALLIVATS (East Indian). Large row-boats, sometimes having as many as fifty oars, formerly and still to some extent used in Eastern waters. They rarely exceed seventy tons, carry two masts with high, triangular sails, and are generally armed with a few small swivel guns, fastened on the bulwarks. The Malay pirates, now nearly exterminated, employ these swift but somewhat fragile vessels.

GALLIWASP (probably of West Indian origin). (1) A lizard of Jamaica and Eastern Central America (*Diploglossus monotropis*), which is greatly feared by the people, though perfectly harmless. (2) A small species of lizard-fish (*Synodus fætens*), common from South Carolina to Brazil. See Plate of LANTERN-FISHES.

GALL-MITE. See MITE.

GALLON. See WEIGHTS AND MEASURES.

GALLOON' (Fr. *galon*, from Sp. *galon*, augmentative of *gala*, finery; probably from OHG., Ger. *geil*, AS. *gāl*, wanton). A narrow, tape-like fabric composed of silk or worsted, or of both. It is usually employed for binding garments, curtains, etc. The small band worn round gentlemen's hats is an example. It is also used as a trimming material, and sometimes has a scalloped edge. When woven in gold or silver tinsel it is used as a trimming for uniforms.

GALLOTANNIC ACID. See TANNIN.

GALLOWAY. An ancient province in the southwest of Scotland, now merged in the county of Wigtown and the stewartry of Kirkcudbright. The designation, though still in use, has no political significance. The district, about 70 miles long by 40 miles broad, is famed for its mountain, lake, stream, and moorland scenery, and forms the peninsula terminating in Scotland's southernmost point, the Rhynns of Galloway, projecting into the Irish Sea. It is purely a pastoral country, remarkable for its mild climate. The simple inhabitants, honest and hospitable, but of lax morality, engage in agriculture and fishing. Its breeds of small horses and large, hornless black cattle have been known for centuries.

The name Galloway is derived from *Gall-Gael*—foreign Gaels, so called because, topographically separated from their northern brethren, they preserved their identity as a distinct race down to the twelfth century, and their language beyond the fifteenth. Ptolemy styled the inhabitants *Novantæ* and *Selgovæ*, and described their towns *Lucophibia*, *Reigionium*, *Uxellum*, *Carbantorigum*, etc., the sites of which have been identified. After the Roman evacuation Galloway came under the power of the Anglians, and later of the Norsemen. Under the Anglians they acquired the name of the Picts of Galloway. In the twelfth century they were conquered by Malcolm Canmore, who made his son David Earl of Galloway. When David ascended the throne of Scotland Galloway was united to the kingdom. The Lords of Galloway, however, frequently revolted against Scotch rule, and the periodical

troubles did not cease until the Lordship of Galloway was attached to the Crown in 1455. Consult: Skene, *Celtic Scotland* (Edinburgh, 1876); M'Kerlie, *History of the Lands and Their Owners in Galloway* (5 vols., Edinburgh, 1870-78); and *Galloway in Ancient and Modern Times* (Edinburgh, 1891).

GALLOWAY, BEVERLY THOMAS (1863—). An American botanist. He was born at Millersburg, Mo., and was educated at the University of Missouri, where he was appointed assistant in the department of horticulture in 1884. After being associated with the division of vegetable physiology and pathology of the United States Department of Agriculture for one year, he was appointed director of the entire department in 1888, and in 1900 he took charge of the office of plant industry.

GALLOWAY, CHARLES BETTS (1840—). An American bishop of the Methodist Episcopal Church, South. He was born at Kosciusko, Miss., and graduated at the University of Mississippi. He entered the ministry in 1868, and was pastor of several churches in his native State. An earnest advocate of the prohibition of the liquor traffic, he was long president of the Prohibition Executive Committee of Mississippi, carried on a spirited controversy with Jefferson Davis on that subject, and wrote a *Handbook* and *Open Letters on Prohibition*. His publications include *A Circuit of the Globe*, and *Modern Missions, Their Evidential Value*. He was for some time president of the Board of Education of his Church, a trustee of the John F. Slater Fund, and president of the Board of Trustees of Millsaps College.

GALLOWAY, JOSEPH (1731-1803). An American lawyer and pamphleteer, prominent as a Loyalist during the Revolutionary War. He was born in Kent County, Md., but early removed to Philadelphia. Almost continuously from 1757 to 1774 he was a member of the Pennsylvania Assembly, and for twelve years was Speaker of the House. In 1764 he was associated with Franklin in the contest with the Proprietary Government, and, in opposition to Dickinson, advocated the erection of Pennsylvania into a royal province. On the approach of the Revolution he was a vigorous opponent of war and of independence. In 1774 he was chosen by the Assembly to be one of the Pennsylvania delegates to the first Continental Congress, and here signed the Association, and attracted general attention by introducing (on September 28th) his celebrated 'Plan of a proposed Union' between Great Britain and her colonies. This plan provided for a federation under British supervision of the American colonies, each colony to "retain its present constitution and powers of regulating and governing its own internal police in all cases whatsoever;" for a President-General, "to be appointed by the King," and for a Grand Council, "to be chosen by the representatives of the people of the several colonies in their respective assemblies, once in every three years," and to meet once a year or oftener if necessary—the President-General and Grand Council to constitute "an inferior distinct branch of the British Legislature, united and incorporated with it," for certain specific purposes. This scheme was supported in Congress by John Jay and James

Duane, and was rejected by a vote of only six colonies to five. In December, 1776, Galloway joined the English army under Sir William Howe, and, on the capture of Philadelphia, became superintendent of the port, of prohibited articles, and of the police of the city and suburbs. After the evacuation of Philadelphia he accompanied the British army to New York, and in 1778 went to England, where he passed the rest of his life. Soon after his departure his life was attainted, and his property, valued at about £40,000, was confiscated by the Continental Congress. He was one of the ablest of the Loyalist pamphleteers. Among his best-known pamphlets are: *A Candid Examination of the Mutual Claims of Great Britain and the Colonies* (1775); *Letters to a Nobleman on the Conduct of the War in the Middle Colonies* (1779); *Historical and Political Reflections on the Rise and Progress of the American Rebellion* (1780); *Cool Thoughts on the Consequences to Great Britain of American Independence* (1780); *Political Reflections on the Late Colonial Governments* (1782); and *The Claim of the American Loyalists Reviewed and Maintained upon Incontrovertible Principles of Law and Justice* (1788). Galloway also wrote *Brief Commentaries upon such Parts of the Revelations and Other Prophecies as Immediately Refer to the Present Times* (1802), and *The Prophetic or Anticipated History of the Church of Rome, Written and Published more than Six Hundred Years Before the Rise of that Church* (1803). Consult: Balch (ed.), *The Examination of Joseph Galloway by a Committee of the House of Commons* (Philadelphia, 1855); Tyler, *Literary History of the American Revolution* (New York, 1897); and Baldwin, "Galloway, the Loyalist Politician," in the *Pennsylvania Magazine of History and Biography*, vol. xxvi. (Philadelphia, 1902).

GALLOWAY, MULL OF. A rocky headland terminating the Rhynns of Galloway, in Wigtownshire, the southernmost point of Scotland (Map: Scotland, D 5). It is one and a half miles long, a quarter of a mile broad, rises to a height of 210 feet, and is crowned by a lighthouse 325 feet above the level of the sea, visible 25 miles.

GALLOWS HILL. The name given to a hill in the neighborhood of Salem, Mass. On it during the witchcraft mania of 1692 a number of victims were hanged as witches. It is also called Witch Hill.

GALLS. In plants, deformities caused by the presence of foreign living organisms in the tissues, by substances which these organisms have produced, or by both causes combined. The technical term 'cecidium' has been proposed as a substitute for 'gall,' with the purpose of using it with prefixes to indicate origin, e.g. myco-cecidium for gall produced by fungi; diptero-cecidium for gall due to gnats, etc. The organism producing the gall is usually either an insect or a fungus, although some galls are due to the attack of slime-molds (Myxomycetes), algæ, bacteria, or worms. Galls show a great diversity of form. The deformity is due primarily to an exaggerated growth of the tissues normally present in the plant organ affected, although the tissues frequently have their cells much altered in form and size; secondarily the gall is due to the

development of special tissues peculiar to galls. The development of the gall is sometimes due to the substance injected by the insect at the time of biting or egg-laying, but more commonly



FIG. 1. FLOWER OF RADISH, greatly enlarged and deformed by a fungus, *Albugo candida*.

it depends upon the presence of the egg or larva, whose excreta or movements supply the necessary stimulus. Attempts to produce galls artificially by injuries or injections have failed.

Galls produced by parasitic plants are usually due to the presence of the organism, and since these are immobile the initial cause must be looked for in the excreta of the attacking plant (Fig. 1). Examples of galls produced by plants are the wens and tumors of various sizes and forms common upon leaves and stems infested by parasitic fungi (Fig. 2). They are not easily

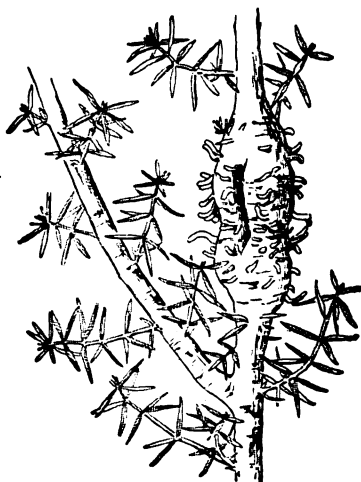


FIG. 2. SHOOT OF JUNIPER, enlarged and deformed by the presence of a fungus, *Gymnosporangium claviforme*.

distinguished in form from similar galls produced by insects. The club-root (q.v.) of cabbage and turnips, due to the attack of slime-molds, and the tubercles upon the roots of Leguminosæ, due to

bacteria-like parasites, are examples of root-galls (Fig. 3). See GALL-INSECTS.

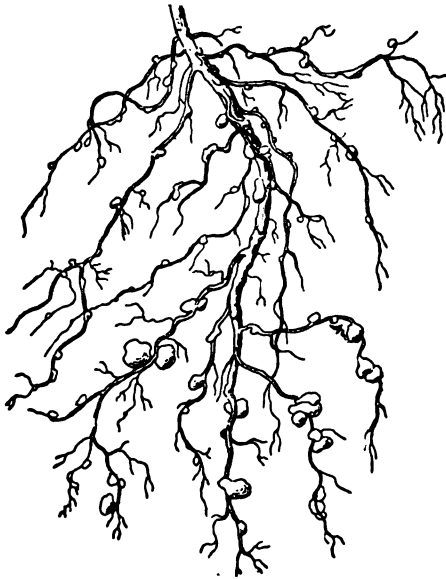


FIG. 3. ROOT-TUBERCLES OF A LEGUMINOUS PLANT, THE PEA, produced by the infection of the roots with *Bacillus radicicola*.

GALL-STONE. See CALCULUS.

GALLUPPI, gá-loop'pè, PASQUALE (1770-1846). An Italian philosopher. He was born in Calabria of a noble family, and educated in the University of Naples. He entered the Government service, and for the greater part of his life he had a position in the Finance Department. Though apart from academic influences, he pursued his favorite studies; and it was not till he had reached the age of sixty and had become widely known by his philosophical writings that he was called to a chair in the University of Naples, which he held till his death. Galluppi's first work was an essay on analysis and synthesis (1807). This was followed by the important *Saggio filosofico sulla critica della conoscenza* (6 vols., 1819-32). Among his other works is to be mentioned *Elementi di filosofia* (1820-27). Galluppi was a thorough-going opponent of the sensationalistic philosophy prevalent in Italy at the beginning of the nineteenth century. He founds his system upon the "original fact of the ego, which perceives something existing outside of itself," thus closely affiliating himself with the Scottish School, by which he was greatly influenced. But in the spirit of Kant he failed to see how experience can give a knowledge of relations, because he regarded relations as the result of conscious activity. His ethics was distinctively Kantian. Consult Lastrucci, *Pasquale Galluppi, studio critico* (Florence, 1890).

GALLUS. A famous story of Roman life by W. A. Becker (1838). The work is important for its faithful reproductions of Roman customs under Augustus, and for the great amount of archaeological information contained in it. It has been translated into various languages and still serves as a handbook for students.

GALLUS, GAIUS CORNELIUS (B.C. 66-26). A Roman poet, orator, and general, born of a humble family at Forum Iulii (now Fréjus) in South-eastern Gaul. At an early age, like many provincials, he went to Rome for an education, and attended the lectures of the Epicurean philosopher Syron. Vergil and Varus were his fellow pupils, and the three became firm friends. He had the fortune, also, to gain the good will and friendship of Asinius Pollio, one of the greatest Romans of the time; and when Octavius (afterwards Augustus) returned to Italy from the East after the assassination of Julius Cæsar, Gallus heartily joined his party, and was given the important charge of assigning lands in North Italy to the veterans of Octavius's army. On this occasion he was able materially to help his friend Vergil, who was a native of Mantua. At the battle of Actium, Gallus commanded a division of Octavius's forces, and afterwards was sent, as general, into Egypt, where he defeated the armies of Antonius, and captured Cleopatra, whom he kept as a prisoner in her palace. Upon her death in B.C. 30, Egypt was turned into a Roman province, with Gallus as its first Governor. He ruled in Egypt for four years, largely with success, but not without making enemies; and an unfortunate remark about Augustus was brought to the Emperor's notice, with many other charges. Gallus was accordingly deprived of his rank and estates, and ordered into exile; but he preferred death, and committed suicide by falling upon his sword in B.C. 26. Gallus attained great renown among his contemporaries as a poet and an orator. He was the author of four books of elegies, and Ovid claimed for him the first place among the Roman elegiac poets; but none of his writings has survived. It was at the request of Gallus that Vergil wrote his tenth Eclogue. In modern times he has been made the hero of a well-known antiquarian story, *Gallus*, by Becker, which was translated into English by Metcalf (London, 1886).

GALLUS, GAIUS VIBIUS TREBONIANUS (c.205-c.254). Roman Emperor from 251 to 254. He served under Decius in the campaign against the Goths, in 251, and is said to have contributed by his perfidy to the disastrous battle in which Decius was killed. Thereupon he was elected Emperor, and shortly afterwards purchased peace with the Goths by permitting them to retain their plunder and their captives and promising them a fixed annual tribute. In 253 the Empire was again invaded by the Goths, but they were defeated in Mœsia by Emilianus, whose troops proclaimed him Emperor. Gallus marched forth to suppress the rebellion, but was killed by his own soldiers before there had been any collision between the opposing armies.

GALLY, MERRITT (1838—). An American inventor, born near Rochester, N. Y. He learned the printing trade, graduated at Rochester University in 1863, studied at the Auburn Theological Seminary, and in 1866 was ordained to the ministry of the Presbyterian Church. After three years of pastoral work, however, he was compelled by the loss of his voice to withdraw from the pulpit, and turned his attention to mechanics. He invented the Universal printing-press, built an establishment for the manufacture of presses, and obtained many patents on appliances connected with printing machinery. His

experiments in regard to automatic musical instruments resulted in the invention of the 'orchestron,' and of the so-called counterpoise pneumatic system employed in similar contrivances. His patents, more than four hundred in number, also include a machine for the manufacture of printer's types from cold metal by a process of swaging.

GALOIS, gá'lwá', EVARISTE (1811-32). A French mathematician, born at Bourg-la-Reine, near Paris, and killed in a duel at Paris at the age of twenty and a half years. While yet a pupil in the Collège de Louis-le-Grand he published in Gergonne's *Annales*, vol. xix. (1828), a memoir entitled *Démonstration d'un théorème sur les fractions continuées périodiques*. Entering the Ecole Normale in 1830, he wrote in the next two years six memoirs on the theory of equations and the theory of numbers. Galois may justly be said to be the founder of the theory of groups (see SUBSTITUTION), and, with Abel and Cauchy, to have been one of the founders of the theory of functions. A well-known theorem on the solubility by radicals of irreducible equations of prime degree bear his name. His works attracted little attention when they first appeared, but their value became recognized when Liouville collected them in his *Journal*, vol. ii. His works were published under the auspices of the Société Mathématique de France, with an introduction by Picard (Paris, 1897).

GALOP, gá'lô' (Fr., gallop). A very lively German round dance in two-four time. It was introduced into France early in the nineteenth century, but its popularity is now confined chiefly to Germany. It is similar to the waltz (q.v.), but is less graceful and more animated.

GALT, gált. A town in Waterloo County, Ontario, Can., on both sides of the Grand River, about 55 miles from its entrance into Lake Erie (Map: Ontario, C 4). Among its industrial establishments are woolen-factories, iron-foundries, and extensive flour-mills. The manufacture of edge tools is carried on to a large extent, and the trade is greatly promoted by the Great Western Railway. The eastern and western parts of the town are connected by bridges. There are a collegiate institute and an extensive library and public reading-room in connection with a mechanics' institute. The town is principally built of stone, and has gas, electric lighting, and water-works. The United States is represented by a consular agent. The environs of the town are noted for their beauty. The inhabitants numbered, in 1891, 7535; in 1901, 7866, the majority being of Scotch descent. The town was named after John Galt, the Scotch author.

GALT, Sir ALEXANDER TILLOCH (1817-93). A Canadian financier and statesman. He was born in Chelsea, London, was educated privately, and in 1835 removed to Sherbrooke, Lower Canada, where he had been appointed to a clerkship in a colonization society. He remained in the service of this company until 1856, and during the latter half of the period was its manager. He began his public career as a Liberal member of the Provincial Parliament in 1849, but opposed the Liberal Government. He resigned in the same year, and did not enter Parliament again until 1853, after which he served continuously until 1872. Such was the reputation he established

that on the fall of the Brown-Dorion Cabinet in 1858 he was called upon to form an administration, but declined. Subsequently he joined the Cartier-Macdonald Cabinet as Inspector-General of the Finances, demanding as a condition of his taking office that the administration should pledge itself to further a federation of the British colonies in North America. He went out of office with the fall of the Ministry in 1862, but held the Finance portfolio in the Tache-Macdonald Administration from 1864 to 1866. He was active in the promotion of the plan for federation, was a delegate at the Charlottetown and Quebec conference in 1864, and in 1865 was one of the delegates to England to urge Imperial support of the plan for union. After the inauguration of the Federal Government he became first Finance Minister of the Dominion of Canada, and secured the issue of legal-tender notes which form the basis of the present currency of the Dominion. He resigned in 1868, and after 1872 his public services were for the most part of a diplomatic nature. He served twice as Commissioner to negotiate with the United States, and from 1880 to 1883 was High Commissioner of the Dominion in England. He was the author of a number of important pamphlets of a political nature, including *Church and State in Canada* (1876); *Civil Liberty in Lower Canada* (1876); *Future of the Dominion of Canada* (1881); and *Relations of the Colonies to the Empire: Present and Future* (1883).

GALT, JOHN (1779-1839). A Scotch novelist. He was born in Irvine, Ayrshire, May 2, 1779. The family removing to Greenock, Galt was educated there, and then placed in the custom-house. He wrote poems and contributed to the newspapers. In 1804 he migrated to London. As a commercial agent, he traveled on the Continent, going as far east as Constantinople. On a part of the voyage he was associated with Lord Byron, whose life he afterwards wrote. As secretary of the Canada Company, he was in Canada for three years (1826-29). Returning to England and then to Scotland, he devoted the rest of his life to miscellaneous literary work. He died at Greenock, April 11, 1839. Galt's poetry, plays, and biographies have little interest. But he holds a secure place in the progress of English fiction by his sketches of Scotch life, among which are *Ayrshire Legatees* (1820); *The Annals of the Parish* (1821); and *Last of the Lairds* (1826). *The Omen* (1825) was praised by Scott; and *Laurie Todd* (1830) has especial interest, as it contains admirable sketches of frontier life in America. Galt undertook to rival Scott in historical fiction, and failed miserably. Consult his *Autobiography* (London, 1833). His novels were edited by Meldrum (8 vols., London, 1895-96).

GALT, Sir THOMAS (1815-1901). A Canadian jurist, son of John Galt (q.v.), born in London, England. He was educated there and in Scotland, but emigrated to Canada in 1832. He found employment for six years with the Canada Land Company, of which his father was superintendent, but afterwards studied law, and began to practice in Toronto (1845). He was made Queen's Counsel (1858), Chief Justice of the Court of Common Pleas (1887), was knighted (1888), and retired in 1894.

GALTON, gal'ton, Sir DOUGLAS STUART (1822-99). An English scientist and engineer, born at Spring Hill, near Birmingham. He was educated chiefly at Rugby and the Royal Military Academy (Woolwich); was appointed second lieutenant of engineers in 1840, and rose to be captain in 1855. In 1847 he was appointed secretary to the Railway Commission, and in 1854 secretary to the Railway Department of the Board of Trade, in which capacity he visited the United States in 1856 to inspect railways there. He became a member of the commission on sanitary conditions in military hospitals and barracks in 1858, and in 1859 chairman of the Government committee for the investigation of submarine cables. From 1860 to 1862 he was assistant inspector-general of fortifications, in 1862-70 assistant Under-Secretary of State for War, and from 1869 until his retirement in 1875 director of public works and buildings in the Office of Works. He was general secretary of the British Association for the Advancement of Science from 1871 to 1895, and a member of the council of the Institution of Electrical Engineers in 1888-90. He was best known for his studies in connection with army sanitation, and his improvements in the construction of hospitals and barracks won for him a high reputation both in England and on the Continent. A ventilating grate for fireplaces, invented by him and known under his name, was at one time widely used. His publications include: *Sanitary Engineering* (1877); *The Construction of Healthy Dwellings* (1880); *Ventilating, Warming, and Lighting* (1884); *Army Sanitation* (1887); and *Healthy Hospitals* (1893).

GALTON, FRANCIS (1822-). An English man of science, born at Birmingham, England, the third son of S. T. Galton and Violetta, eldest daughter of Erasmus Darwin. He was educated at King Edward's School, Birmingham, at the Birmingham General Hospital, at King's College, London, and at Trinity College, Cambridge, where he was graduated B.A. in 1844. During 1846-47 he traveled in Egypt far beyond the temples and cataracts of the Nile to the Sudan, at that time almost unexplored. As a result of the stimulus given by this expedition he started in 1850 to explore in South Africa. In company with J. C. Andersson, he landed his expedition at Walfish Bay, and from August, 1850, to January, 1852, he was engaged in the exploration of Damaraland (German Southwest Africa). In these travels he discovered the *Ovanipo* race, a partly civilized, agricultural people. As a result of this exploration the whole country from Lake Ngami to the seacoast, between 18° and 23° S. latitude, became known for the first time. The scientific results of the expedition were published in the *Royal Geographical Society's Journal* for 1852, and in his book, *Narrative of an Explorer in Tropical South Africa*. Galton also published *Art of Travel, or Shifts and Contrivances in Wild Countries* (1855), which has gone through several editions, has won well-merited appreciation, and exhibits Galton's characteristic ingenuity. About this time Galton turned his attention especially to meteorology, the result of which was his *Meteorographica, or Methods of Mapping the Weather* (1863), which is the basis of our present familiar weather maps. The theory of anticyclones, which

is at the foundation of our weather forecasts, was also proposed by him, and various inventions relating to meteorologic and geographic affairs were given out by him from this period to 1881. This interest in the statistical science of meteorology had an importance in Galton's future work. In 1869 was published his *Hereditary Genius*, and from that time on his anthropological and biological interests, first awakened in Africa, became uppermost. In 1873 he first began to apply statistics to anthropology, especially those of children. In 1874 appeared his *English Men of Science*, and in 1883 his *Inquiries into Human Faculty*. Meanwhile, he invented the method of composite portraiture and various measuring apparatuses in psychology. In 1883 he sought for quantitative data on inheritance, and issued his blank *Record of Family Faculties*, of which 150 were filled out and sent to him for study. The results of these studies appeared in his *Natural Inheritance* (1889), in which the quantitative method of studying variation is developed. In 1892 was published his *Finger Prints*, and shortly after his *Idea of Finger Prints*. In his paper published in the *Proceedings of the Royal Society* on "The Law of Ancestral Inheritance," he put the study of heredity on a quantitative basis.

GALTON WHISTLE. See PSYCHOLOGICAL APPARATUS.

GALUPPI, gá-lóop'pé, BALDASSARE (1706-85). An Italian composer. He was surnamed IL BURANELLO, from the island of Burano, near Venice, the place of his birth. He was the pupil of his father, a barber, who was a good violinist. Although the composer of many operas and smaller works, all are now forgotten except a sonata for the harpsichord, which is included in the *Alte Klaviermusik* of Pauer. His principal success was in comic opera, by which he gained the title of 'father of Italian comic opera.' Apart from this, he is of some importance historically, owing to his connection with the growth of music in Russia. His principal appointments and tours were: 1741, tour to England; 1762-64, master of music at San Marco, Venice, and director of the Conservatorio degli Incurabili; 1765-68, maestro to Catharine II. of Russia; and afterwards, up to the end of his career, director again of the Incurabili in Venice. He died in Venice.

GALVANI, gál-vá'né, LUIGI (1737-98). A famous Italian physician and anatomist, and the discoverer of current or 'galvanic' electricity. He was born at Bologna, and at an early age relinquished an intention of entering the Church, to follow the profession of medicine, devoting himself to the study of physiology and comparative anatomy. He married the daughter of Galeazzi, a distinguished member of the medical faculty of Bologna, whom he succeeded in 1762 as professor of anatomy. His writings, though not numerous, contain valuable scientific matter, and are characterized by a rare precision and minuteness of detail. Two treatises which added considerably to his reputation are: *Considerations on the Urinary Organs of Birds*, and *On the Organs of Hearing of Birds*. It is to a purely casual discovery, however, that Galvani owes the wide celebrity attached to his name. It is related that Galvani's wife happened one day

to notice the convulsive muscular movements produced in a skinned frog when the nerve of the leg was accidentally touched by a scalpel which lay on the table, and had become charged by contact with an adjoining electric machine. She communicated the phenomenon to her husband, who instituted a prolonged series of experiments (1790). He came to the conclusion that the source of electricity lay in the nerve, and that the metals which are necessary served merely as conductors. (See ELECTRICITY; and ELECTRICITY, ANIMAL.) In consequence of his refusal to take the oaths prescribed in 1797 by the Cisalpine Republic, of which Bologna formed a part, he was deprived of his position and income, but was subsequently restored. A statue of Galvani was unveiled at Bologna in 1879. His writings have been chiefly published in the memoirs of the Bologna Institute of Sciences, including the treatise entitled *De Viribus Electricitatis in Motu Musculari Commentarius* (1792), which contained an account of his discovery and experiments, and translated into German is to be found in Ostwald's *Klassiker der Exakten Wissenschaften*, No. 52 (Leipzig, 1894). A complete set of his works was published at Bologna in 1841. See GALVANIC BATTERY; VOLTAIC CELL OR BATTERY.

GALVANIC BATTERY. The names of Galvani and Volta have both become inseparably associated with the earliest device to produce a continuous current of electricity—a device now commonly known as a *voltaic cell*. In its simplest form it consisted of a strip of zinc and one of copper immersed in a solution of salt, or of an alkali.

Galvani, in 1786, made the capital discovery that freshly prepared frogs' legs, hung by a copper wire on an iron balcony, twitched convulsively whenever the flesh touched the iron. He rightly ascribed this effect to electricity, but erroneously supposed that it proved the existence of animal electricity generated by nerves and muscles. Volta showed by experiment that Galvani was wrong, but he made the equally erroneous assumption that the electricity was due to the contact of the two dissimilar metals. His experiments led, however, to the invention of the celebrated 'crown of cups' about 1800, consisting of a number of simple elements or cells joined in series, the copper strip of one being connected with the zinc of the next. Such cells and their less simple successors are therefore properly called voltaic cells, though the word 'galvanism' is still retained in medical literature to denote the current obtained from them.

When Davy, in 1801, substituted dilute acid for Volta's salt or alkaline solution, it was found that there was local action which caused the zinc to waste away. Kemp and Sturgeon, in 1830, drew attention to the fact that a diminution of this local action was brought about by the amalgamation of the zinc plate. The amalgamation consists in forming a mercury-zinc alloy on the surface of the zinc. This is best done by first cleaning the zinc by rubbing it with dilute sulphuric acid, and then applying a small quantity of mercury. The amalgamated zinc plate acts like pure zinc, and wasteful local action is largely prevented. See VOLTAIC CELL OR BATTERY for a full discussion of primary cells and batteries.

GALVANISM. See ELECTRICITY.

GALVANIZED IRON. Iron which has been coated with zinc, to prevent it from rusting. The iron is simply dipped or immersed in melted zinc, not coated by any galvanic process, as its name would imply. The process of galvanizing iron is now practiced on a most extensive scale. The French chemist Dumas states that so long ago as 1742 Malouin knew of a plan for coating iron with zinc. At all events, it is stated in Bishop Watson's *Chemical Essays*, issued in 1786, that a method (essentially the same as that now in use for zincing iron) was then practiced at Rouen for coating hammered iron saucepans with zinc, and some details of the operation are given. The first English patent for galvanizing iron was granted to H. W. Craufurd in 1837, and another for the zincing of iron which had been previously tinned was taken out by E. Morewood in 1821. The process as employed by Craufurd, which is still essentially unchanged, was first to remove the rust and scale from the iron by *pickling*—that is, immersing it in dilute sulphuric or hydrochloric acid, either hot or cold, although the former state was preferred; and for this purpose the acid was kept warm in a large leaden bath, sunk in the ground for easier access. After the sheets or other articles of iron had been acted upon by the acid for a few minutes more or less, according to their requirements, they were plunged into cold water, to remove the acid, and afterwards scoured with sand, and again washed clean with water. The iron being now ready to receive its coating of zinc, it is plunged into a bath of that metal, which, previous to its being melted, is coated with a thick layer of dry sal ammoniac (chloride of ammonium); this melts also, and forms a viscid coating over the metal, which prevents that rapid oxidation to which the molten metal is otherwise liable.

For inferior material the scouring with sand is usually dispensed with. The sheets of iron are then made to pass between two iron rollers in the zinc bath, and are thus more easily drawn through and kept perfectly smooth. Ships' bolts, nails, screws, chains, etc., are dipped in, in bundles, or in the case of nails, etc., in iron strainers; when removed, the zinc makes them adhere together; and to effect their separation, they have to be placed in a crucible with powdered charcoal, in which they are heated to redness, and repeatedly shaken as they cool; by this means they are easily separated.

Galvanized iron is largely used in the form of sheets, both plain and corrugated, for roofs, sheds, and cisterns; in the state of wire, besides that used in telegraphs, a large quantity is employed for wire ropes, netting, and the like; and it has innumerable minor applications, such as for water-vessels, ship-fittings, and many other articles formerly made of wood, copper, brass, slate, etc. For most of these purposes the zinc coating is much more lasting and less troublesome than they would be; but still in certain situations, as where it is exposed to the action of sulphurous compounds in smoke, and where its surface is brought directly into contact with other deleterious chemical substances, its use cannot be recommended; and in these circumstances other plans should be resorted to for the protection of the iron.

The plan adopted for making the variety of galvanized iron called *galvanized tinware* is as follows: The sheets or other articles, after being pickled, and scoured, and washed, as in the usual process, are transferred to a large wooden bath. On the bottom of the bath is first placed a layer of finely granulated zinc, then a sheet of iron, then another layer of granulated zinc, and so on as far as convenient; and the bath is filled up with a diluted solution of chloride of tin, so that by means of the galvanic action produced the tin becomes deposited thinly over the sheets of iron. The plates are then taken to the zinc bath, prepared exactly as in the ordinary process, where they are dipped or passed through the rollers. By this process a very even deposit of zinc is produced, and the material so made is preferred for some purposes to ordinary galvanized iron, although its properties are much the same.

GALVANOMETER (from *galvanic* + *Gk. μέτρον*, *metron*, measure). An instrument for detecting the presence of an electric current and measuring its magnitude. It consists of a coil of insulated wire surrounding a magnet, freely hung or pivoted so as to be easily deflected by the passage of a current through the coil. The wire forming the coil is so wound that each turn lies in a plane approximately parallel to the axis of the needle or magnet when at rest. The current in passing through the coil or bobbin of insulated wire produces a magnetic field in the space in which the needle hangs and tends to swing the needle around, until it hangs crosswise in the coil. The force tending to deflect the needle is proportionate to the strength of this field, or, what is the same thing, the strength of the current producing it, and to the length and strength of the needle, while the magnetic force of the earth acts to keep the needle in the direction of the magnetic meridian. Under the influence of these two forces the needle will come to rest in a position where they are in equilibrium. As the shape and strength of the magnetic needle, speaking broadly, remain the same in a given galvanometer, the instrument affords a means of measuring the strength of any current passed through it, by the amount of motion imparted to the needle.

These conditions can be reversed and the coil suspended and the magnetic field produced by a permanently mounted magnet, as in the case of the D'Arsonval galvanometer described below. Galvanometers are constructed in a great variety of forms, specially suited to various uses, from simple instruments for merely indicating the presence of a current to extremely elaborate apparatus for making measurements of great accuracy. The action of the galvanometer depends upon the following principle discovered by Oersted in 1820: When a magnetic needle is placed under a straight wire, through which a current passes, it is deflected to a certain extent, and when the wire is bent, so as also to pass below the needle, it is deflected still more. The north pole of the needle is deflected to the left if the current is flowing from south to north in a conductor which is placed above the needle, and vice versa when the conditions are reversed. The direction of the deflection can be remembered by *Ampère's rule* which states that supposing a man swimming along the conductor in the direction of the flow of the current and always facing the needle, the latter will be deflected toward his

left hand. The current in the upper and the lower wire moves in opposite directions, but as they are on opposite sides of the needle, the deflection caused by both wires is in the same direction. By thus doubling the wire, we double the deflecting force. Schweigger and Poggendorf soon ascertained that if the wire, instead of making only one circuit round the needle, were to make two, the force would be again double, and if several, the force (leaving out of account the weakening of the current caused by the additional wire) would be increased in proportion. If the circuits of the wire are so multiplied as to form a coil, this force would be enormously increased, and the galvanometer rendered more sensitive. These early galvanometers were called

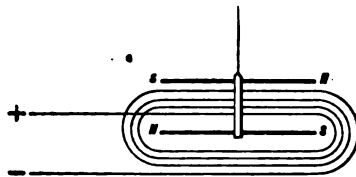


FIG. 1. ASTATIC NEEDLE AND COIL.

multipliers, and have been much used. The next improvement in the instrument was due to Nobili, who employed two needles, placed parallel to each other as nearly as possible, with their poles turned opposite ways and suspended by a thread without twist. These needles have little tendency to place themselves in the magnetic meridian, for one tends to move in a contrary direction to the other. If they were exactly equivalent, they would remain indifferently in any position; but they cannot be so accurately paired as this, for they almost always take up a fixed position, arising from the one being somewhat stronger than the other. Such a compound needle is called *astatic*, as the magnetic influence of the earth does not determine the direction in which it will point. If an astatic needle be placed in a coil, so that the lower needle be with-



FIG. 2. ASTATIC GALVANOMETER.

in the coil, and the upper one above it, its deflections will be greater than those of a simple needle, for two reasons. In the first place, the power which keeps the needle in its fixed position is small, and the needle is consequently more easily influenced; in the second place, the force of the coil is exerted in the same direction on two needles instead of one, for the upper needle, being much nearer the upper part of the coil than the lower, is deflected alone by it, and the deflection is in the same direction as that of the lower needle. An astatic needle so placed in a coil constitutes an astatic galvanometer. The coil is formed of fine copper wire, insulated with silk, and wound on a frame or bobbin. The as-

tatic needle is placed in this bobbin, which is provided with a vertical slit, to admit the lower needle, and a lateral slit, to allow of its oscillations, and is suspended by a cocoon fibre from a hook supported by a brass frame. The upper needle moves over a graduated circle, and the entire system hangs freely, without touching the bobbin. The instrument is inclosed in a glass case, and rests on a stand, supported by three leveling screws. When used, the bobbin carrying the divided circle with it is turned until the needle stands at the zero point of the scale, and

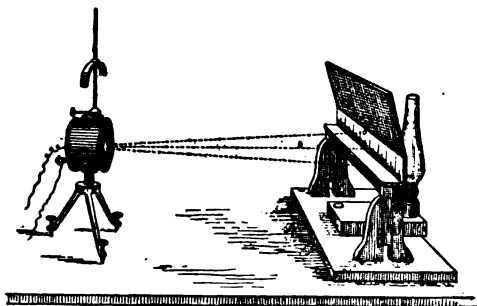


FIG. 3. THOMSON REFLECTING GALVANOMETER (SINGLE COIL).

the wires through which the current is sent are joined to the bending posts, which connect with the terminals of the coil. The number of degrees that the needles are deflected under the action of the current may then be read off, showing the strength of the current.

For most kinds of testing and measurement extremely sensitive galvanometers are required. Of these, the reflecting galvanometer, designed by Sir William Thomson, is one of the standard types. It is shown in the illustration. In this instrument a reading is made by the use of a ray of light reflected upon a screen from a mirror attached to the needle so that even the smallest motion is shown. The Thomson galvanometer consists of a pair of astatic needles attached by shellac or other adhesive material to a mirror made of very thin microscope glass. This is superseded by a single fibre of raw silk in the centre of a coil containing many thousand turns of fine wire. The whole is suitably protected from currents of air by a glass case, and the base is mounted upon leveling screws, so that the hanging needle may be adjusted to swing freely in the centre of the coil. The needle is caused to point to zero of the scale by a powerful magnet outside of the case which is adjustable as to direction by a tangent screw, and may be removed to any distance to weaken its effect upon the needle or increase its sensitive-



FIG. 4. THOMSON DOUBLE COIL GALVANOMETER.

ness. This galvanometer is much used in all kinds of testing work and for reading the delicate signals in ocean telegraphy. Increased sensitiveness may be obtained by using two sets of coils and needles, while there have been Thomson galvanometers constructed in which there were four such sets of coils.

For experimental work and laboratory demonstrations the tangent galvanometer is used. This instrument is shown in the illustration. It con-

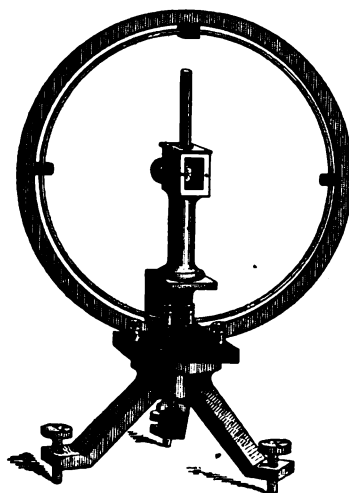


FIG. 5. TANGENT GALVANOMETER.

sists essentially of a thick strip or wire of copper bent into the form of a circle, from one to two feet in diameter, with a small magnetic needle with pointers of thin glass fibres moving on a graduated circle, at its centre, supplied with a mirror. When the needle is small compared with the ring, it may be assumed that the needle, in whatever direction it lies, holds the same relative position to the disturbing power of the ring. This being the case, it is easy to prove that the strengths of currents circulating in the rings are *proportional to the tangents of the angles of deviation of the needles*. Thus, if the deflection caused by one voltaic cell was 45° , and of another 60° , the relative strengths of the currents sent by each would be as the tangent of 45° to the tangent of 60° , viz., as 1 to 1.73. The needle can never be deflected 90° , for as the tangent of 90° is infinitely large, the strength of the deviating current must be infinitely great, a strength manifestly unattainable. The tangent galvanometer can consequently be used to measure very strong currents.

A common or detector galvanometer is an instrument used in ordinary shop work, and for outdoor testing, where a portable instrument is required, and the other forms are too delicate. It contains a large magnetic needle or compass swinging upon a pivot. A small cavity formed in an agate let into the centre of the needle is usually employed to prevent friction in swinging upon the pivot. The coils of wire are placed underneath the dial bearing the graduations over which the needle swings, and the whole is inclosed in a round brass box, with a glass cover over the needle. For convenience, a circuit-closing key for admitting current to the coil is often

built into the case and permanently connected with the coils. Such a galvanometer is often used in connection with a set of resistances for making measurements of resistance by the Wheatstone bridge (q.v.), and in that case the apparatus is known as a combination or portable testing set.

THE D'ARSONVAL GALVANOMETER is quite different in its underlying principle from the instruments already described, for instead of having the magnet suspended and deflected under the influence of the current in a surrounding coil of wire, the coil itself is suspended between the poles of a compound horseshoe magnet. This coil is made of fine copper wire, wound on a rectangular frame of thin copper, and suspended by a fine wire of silver or copper, through which the current flows to the coil. The other end of the coil is connected to a similar wire, which leads to one of the binding posts, the supporting wire being connected with the other. The coil can thus oscillate freely in the space between the two magnets, and is in a strong magnetic field.

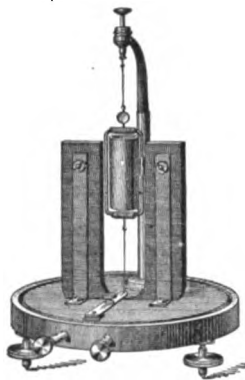


FIG. 6. D'ARSONVAL GALVANOMETER.

When a current flows through the coil an opposing field is set up, and the coil, being free to move, is deflected. The motion of the coil can be determined either by a light pointer or by means of a mirror and a reflected beam, as in the case of the Thomson galvanometer. The D'Arsonval galvanometer is, perhaps, at the present time the most used of any form of galvanometer, since it is not affected by any external magnetic influences, and is easily adjusted. It is also aperiodic, or 'dead beat,' the coil coming to rest almost instantly and thus saving much time to the observer. For these and other reasons this galvanometer is extensively used for making tests and measurements, and certain modifications have been introduced, so as to render the apparatus portable and indicate current and electromotive force directly by means of a pointer and scale. These instruments form the most accurate ammeters and voltmeters.

THE BALLISTIC GALVANOMETER is intended to measure currents of extremely brief duration, such as those produced by the discharge of a condenser or by induction, and a magnetic needle is employed that has a period of vibration amounting often to several seconds. Instead of coming to rest after its deflection by the current, the needle will continue to oscillate, as there are no damping devices, and as the needle itself has considerable mass. When used to measure a momentary current, the deflection does not begin to move practically until the current has passed, and then the throw of the needle is noted. This instrument is used to determine the capacity of a condenser and to measure self-induction. Consult Kempe, *Handbook of Electrical Testing* (6th ed., London, 1900); Thompson, *Elementary Lessons in Electricity and Magnetism* (New York, Vol. VIII.—97.

1901), contains a full elementary description of galvanometers and the theory of their action.

GALVESTON. A city, port of entry, and the county-seat of Galveston County, Tex., on Galveston Island, at the mouth of Galveston Bay, 50 miles southeast of Houston; on the Southern Pacific, the International and Great Northern, the Missouri, Kansas and Texas, the Gulf, Colorado and Santa Fé, and other railroads (Map: Texas, G 5). Regular steamship communication is maintained with important European, Mexican, and Cuban ports, and there are also lines to China, Japan, and South America, as well as several coastwise lines. The street-railway system comprises 35 miles of track.

The city, including Pelican Island, has a total area of nearly 13 square miles, and is built toward the inland side of the island, while along the outer side extends, for a distance of 30 miles, a hard and level beach. Galveston is the seat of Saint Mary's University (Roman Catholic), opened in 1854, and of the medical department of the State University. It has two Roman Catholic academies, the Ball High School (one of the city's principal buildings), and a fine library in course of erection, which is to be endowed with \$400,000. There are two orphan asylums, a home for friendless children, and an old women's home, and two well-equipped hospitals, Saint Mary's and the John Sealy, the latter used in connection with the State Medical College. Other notable structures are the county court-house, custom-house and post-office, city hall, railroad depot, Young Men's Christian Association Building, Masonic Temple, and several of the business buildings. There are here three forts, a life-saving station, a State quarantine station, an office of the United States Marine Hospital Service, and the State branch of the United States Weather Bureau. A railroad bridge, two miles long, connects with the mainland.

Galveston, with an admirable location for a commercial centre, has also improved means for handling its important commerce. Both by rail and water transportation facilities are excellent. By means of rock jetties, 12 miles long, completed by the Federal Government in 1896 at a cost of \$8,000,000, the channel between the island and the mainland has been deepened to afford an average of 27 feet. Terminal tracks, aggregating 50 miles, extend to the wharves, of which there are now 6 miles. There are four export grain elevators, with a total storage capacity of 3,750,000 bushels, and one clearing and conditioning elevator, a coal elevator, marine works, creosoting works, etc.

Galveston in 1901 ranked third among ports of the United States in exports (value, \$106,526,508), a gain of \$14,000,000 over 1900; and thirty-sixth in imports (value, \$1,048,866). Since the improvements in the harbor, the export trade has substantially increased, though, on the contrary, imports have decreased. The city alternates with New Orleans as the largest cotton-exporting centre in the United States, is the first in the amount of cottonseed products, and eighth in wheat. In value the leading exports for 1901 were: Cotton, \$85,857,145; oil cake and meal, \$5,568,449; cottonseed oil, \$1,502,307; wheat, \$1,476,205; flour, \$462,607; lumber, \$479,457. The live-stock trade is now compara-

tively unimportant; the lumber exports have fallen off because of the unusual demand at home; and imports of coal have suffered considerably, owing to the discovery of Beaumont oil, which is being used largely for fuel. Galveston is the centre of an extensive wholesale and jobbing trade. The manufacturing interests are important and varied; the products include rope, bagging, beer, cement, pipe, ice, iron, sash, doors, blinds, cotton oil, flour and meal, etc.

The government, under a charter of 1876 (last revised in 1893), is vested in a mayor, chosen biennially, and a city council, the members of which, though elected one from each ward, are voted for by the entire city. The executive appoints the recorder and the city clerk, and nominates, subject to the consent of the council, a number of other municipal officials. The boards of water commissioners, health, public works, and school trustees, the hospital board, and police and fire commissioners, are chosen by popular vote. The water-works and electric-light plant are owned and operated by the municipality. Population, in 1890, 29,084; in 1900, 37,789.

Early in the nineteenth century the site of Galveston was a favorite resort for pirates, who established themselves here under the leadership of the notorious Jean Lafitte (q.v.). They were driven from the locality in 1820, but soon reestablished themselves, and in 1827 were again driven away by the United States authorities. A permanent settlement was made in 1837, and two years later the first charter of incorporation was obtained. On October 8, 1862, during the Civil War, a Federal force took possession without opposition; but on January 1, 1863, the Confederates under Magruder captured the city and secured 350 prisoners. In November, 1885, there was a destructive fire, and on September 8, 1900, occurred the most terrible disaster resulting from purely natural causes in the history of the North American continent. A West Indian hurricane, lasting eighteen hours—the wind veering in every direction and reaching a maximum velocity estimated at 135 miles an hour—swept over the city, and the streets were flooded to a maximum depth of 16 feet above mean low tide. Within a period of five hours, but chiefly between 7 and 9 o'clock p.m., 6000 lives were lost, and property, including 7000 buildings, valued at \$18,000,000, was destroyed. Help poured in from all parts of the country, and much of the suffering was thus alleviated, though a large part of the city had been totally destroyed. The municipal government was placed in the hands of five commissioners, two elected and the others appointed by the State Governor, and the work practically of creating a new city was begun, with the present results as detailed above. During 1901 nearly \$4,000,000 was expended for permanent improvements. A committee of eminent engineers in 1901 made plans and specifications for a breakwater, estimating the cost of a sea-wall at \$1,250,000, and attendant filling in of the city to a commensurate grade at \$2,250,000. In the same year the city received from the Federal Government an appropriation of about \$1,000,000, 90 per cent. of which went for reconstruction of the fortifications. Other improvements projected for the immediate future

are the repair of the jetties and the widening and deepening of the channel.

GALVEZ, gal'vath, BERNARDO, Count de (1755-86). A Spanish administrator, Governor of Louisiana and Viceroy of Mexico. He was born near Malaga, a member of a powerful Spanish family; entered the army in 1771; studied military science in France in 1772-75; served under O'Reilly against the Algerians in the latter year, rising to the rank of brigadier; and in 1776 was sent to Louisiana as Lieutenant-Governor under Luis de Unzaga, whom he succeeded in the same year. During the Revolutionary War his sympathies were largely with the Americans, whom he assisted in various ways, even before Spain's declaration of war against England in June, 1779, after which he prosecuted hostilities with considerable energy against the English possessions in this part of the country, and succeeded in capturing Fort Manchac, Baton Rouge, and Fort Panmure (1779), Mobile (1780), and Pensacola (1781). For these successes, and as a reward for his general administrative efficiency, he was raised in 1783 to the rank of count, was promoted to be lieutenant-general, and was appointed Captain-General of Cuba. This position, however, he relinquished two years later, to succeed his father as Viceroy of Mexico, where he lived with much ostentation, and for this, and for his construction of a fortified palace at Chapultepec, was accused by many of planning to create an independent Mexican kingdom, with himself as king. Both in Mexico and in Louisiana he introduced numerous and important reforms, and he has been regarded as one of the ablest Spanish administrators ever sent to America. Consult: Gayarré, *History of Louisiana*, vol. iii. (last ed., New Orleans, 1885); and Bancroft, *History of Mexico, 1516-1887* (San Francisco, 1883-88).

GALWAY. A maritime county of Connaught, Ireland, and, after Cork, the largest of the Irish counties (Map: Ireland, B 3). It is bounded on the east by the Shannon and its affluent the Suck, and on the west by the Atlantic Ocean. Area, 2452 square miles, of which bog and marsh make up about 15 per cent. The coast-line is about 400 miles in length, and the shore, much broken, is fringed with numerous islands. Copper is the only mineral of importance that is found. Agriculture and fishing are the leading pursuits; the production of kelp is large; and woollens, linens, friezes, and felt hats are manufactured. Chief towns, Galway, the capital, and Tuam. Population, in 1841, 440,700; in 1851, 322,430; in 1891, 211,227; in 1901, 192,150.

GALWAY. The capital of Galway County, Ireland, a municipal and Parliamentary borough, seaport, and civic county at the mouth of the Corrib on the north shore of Galway Bay. 50 miles north-northwest of Limerick, and 130 miles west of Dublin (Map: Ireland, B 3). It is built on both sides of the river, and on two islands in its channel, its parts being united by two bridges. It is connected with Lough Corrib by a canal, and forms the terminus of the Midland Great Western Railway. Galway has numerous flour and other mills, brush factories and breweries, distilleries, foundries, etc., salmon and sea fishing, a good harbor, with docks and a lighthouse. It exports agricultural produce, wool, bacon, fish, kelp, and a fine black marble, and im-

ports grain, timber, petroleum, and manure. The old town of Galway is poorly built and irregular, and some of its older houses have a somewhat Spanish appearance. One of these houses, marked with a skull and cross-bones, was the residence of James Lynch Fitzstephen, a mayor of Galway, who, in 1493, condemned his son to death for murder, and to prevent his rescue, caused him to be hanged from his own window. The new town consists of well-planned and spacious streets, built on rising ground, which slopes gradually toward the sea and the river. Claddagh, a suburb, is inhabited by fishermen, who exclude all strangers from their society, and marry within their own circle. These fishermen still speak the Irish language, and the Irish costume is still worn by the women. They annually elect a 'mayor,' whose function it is to administer the laws of their fishery, and to superintend all internal regulations. Attached to the Anglican diocese of Tuam, Galway is also a Catholic episcopal see. The principal buildings are the parish Church of Saint Nicholas, founded in 1320, Saint Augustine's Catholic Church, three monasteries, and five nunneries, Queen's College, the county court-house, barracks, etc. The town returns one member to Parliament.

Galway was taken by Richard de Burgo in 1232, and the ancestors of many of the leading families resident in this quarter settled here about that time. Galway rose in commercial importance chiefly through its Spanish trade, from the thirteenth to the middle of the seventeenth century. During the seventeenth century it suffered for its adherence to the Royalist cause. In 1652 it was taken by Sir Charles Coot after a blockade of several months; and in July, 1691, it was compelled to surrender to General Ginckell. Population, in 1851, 20,686; in 1891, 13,800; in 1901, 13,414. Consult Hardiman, *History of the Town and County of Galway* (Dublin, 1820).

GALWAY BAY. An inlet of the Atlantic Ocean, on the west coast of Ireland, between the counties of Galway and Clare (Map: Ireland, B 3). It is 30 miles long from west to east, with an average breadth of about 10 miles. The islands of Aran form a natural breakwater at its entrance between the north and south sounds. There are lighthouses on Inisheen, Mutton, Eeragh, and Straw Islands, and at the entrance to Galway docks.

GALYZIN, gá-lét'sén. See GOLITZIN.

GAMA, gá'má, JOSÉ BASILIO DA (1740-95). A Brazilian poet, born at São José (Minas Geraes). He became a novice in the Jesuit College at Rio de Janeiro. Upon the expulsion of the Order in 1759, he continued his studies at the seminary of São José, and subsequently went to Portugal and then to Rome, where in 1763 he was admitted as a member of the literary circle known as the *Arcadia*. Having returned by way of Portugal to Rio de Janeiro, he was there denounced as a Jesuit, and was sent to Lisbon on a ship of war. Here he openly declared against the Jesuit Order, found a patron in Pombal, the Portuguese statesman, wrote an ode celebrating the dedication of an equestrian statue of José I, was elevated to the nobility in 1771, and in 1774 received an official post in the Ministry of Foreign Affairs. When his protector was dismissed from office in 1777, he proceeded to Rio de Janeiro, where he

organized an *Arcadia Ultramarina*, in imitation of that at Rome. This society having been dissolved in 1790 by the new Viceroy, the Count of Rasende, who suspected plots, and its members having been threatened with imprisonment, Da Gama returned to Lisbon and there lived in retirement until his death. His chief work is the epic *Uruguay* (1769), in which he endeavors to show that the Jesuits of the Seven Missions sought to found in Uruguay an independent theocratic State. Besides *Uruguay*, which enjoyed a high popularity in Brazil, he also wrote shorter poems entitled "Quitubia" and "Cantico aos Campos Elysios."

GAMA, gá'má, VASCO DA (c.1469-1524). A Portuguese navigator and the first European to reach India by the maritime route round Africa. He was descended from a noble family, and was born at Sines, a small seaport of Portugal. After some years at Court he was chosen to command the expedition dispatched by King Emmanuel to India by the all-sea route, the possibility of which had been revealed by the rounding of the Cape of Good Hope by Bartholomeu Dias in 1488, and confirmed by the explorations of Covilhão, who had reached India by way of the Red Sea, and had crossed the Indian Ocean from Goa to Sofala. Vasco da Gama sailed from Lisbon July 8, 1497, and, doubling the Cape of Good Hope in November, reached in December the Rio do Infante, the farthest point attained by Dias. There he had to suppress a mutiny of his sailors, who shrank from facing the unknown dangers that awaited them. They breasted the strong Agulhas current, and on Christmas Day, 1497, sighted the coast, which da Gama, in honor of the day, named Natal (*dies Natalis*). Past Delagoa Bay, Quillimane, and Mozambique they sailed, until, on April 15, they anchored off Melinde, where they took on board an Indian pilot, a native of Gujarat. A voyage of twenty-three days across the Indian Ocean brought the vessels to the coast of Malabar, which was sighted on May 17, 1498. The ruler of Calicut did not receive the Portuguese very favorably, and da Gama was forced to fight his way out of the harbor when he started homeward. He rounded the Cape once more in March, 1499, and on September 8 reached Lisbon. A fleet was immediately dispatched for India under Pedro Alvarez Cabral, whose ships were driven out of their course westward, the discovery of Brazil being the result. In 1502 da Gama sailed again for India, planting Portuguese colonies on the way at Mozambique and Sofala. On reaching Calicut he bombarded the place, destroyed the fleet of the Rajah and forced him to conclude peace. In December, 1503, he was back in Portugal with a fleet bearing rich cargoes, and was received with great honor and given the titles of Count Vidigueira and Admiral of the Indian Ocean. For twenty years da Gama saw no active service. Then in 1524, he was dispatched with a fleet to India as the sixth Viceroy of Portuguese Asia, but soon after his arrival he died at Cochin on Christmas Day, 1524. The fame of da Gama is due, perhaps, less to the merit of his exploits than to the place assigned him by Camões in his epic, "Os Lusíadas." Consult: Correa, *The Three Voyages of Vasco da Gama and His Viceroyalty*, Hakluyt Society Publications (London, 1869); Alvaro Bel-

ho, *Roterio da viagem que em descobrimento da India pelo cabo da Boa Esperança fez Dom Vasco da Gama em 1479*, trans. by Ravenstein, Hakluyt Society Publications (London, 1898).

GAMA GRASS, or **SESAME GRASS** (*Tripsacum*). A genus of grasses indigenous to America, said to be named from the Spanish gentleman who first attempted its cultivation in Mexico. Only two or three species are known, of which the gama grass (*Tripsacum dactyloides*) of Mexico is distinguished by usually having three spikes together. It produces a large quantity of coarse fodder, for which it is cultivated, not only in Mexico, but in the United States, and to some extent in Europe. In favorable circumstances it yields a very abundant crop, and attains a height of nine or ten feet, its root-leaves measuring six feet in length. It possesses what for some climates is an almost invaluable property of enduring excessive drought without injury, but suffers from frost. It seems eminently adapted to the climate of Australia. *Tripsacum fasciculatum*, a native of Mexico, attains a height of fifteen to twenty feet.

GAM'ALA. An ancient fortress of Palestine, situated on the Lake of Tiberias and supposed to be either the modern *El-Hussu* or *Khan-el-akbah*. In the Jewish war of 66-70, Gamala, which had been fortified by Josephus, was vainly besieged by Agrippa, but finally taken by Vespasian, who slaughtered 9000 of the defenders.

GAMALIEL, gā-mā'li-ēl (Heb., 'God is a reward'). A noted Pharisee, twice referred to in the Book of Acts: (1) In v. 34-39, where, as a member of the Sanhedrin, he counseled, from the point of caution, moderate measures regarding Peter and the other Apostles; and (2) in xxii. 3, where Paul speaks of him as his instructor in the law. Jewish tradition identifies him with the famous Rabbi Gamaliel, the elder, the son of Simon and the grandson of Hillel, the founder of the more liberal of the two Pharisaic schools. This Gamaliel was the first of the seven Jewish doctors who received the honored title of Rabban, and was held in such reputation that when he died, according to Mishna (*Sota* ix. 15), "reverence for the law ceased, and purity and abstinence died away." At the same time, in Gamaliel's day, instruction in the law was much more in sympathy with the spirit of practical life than was the case in the time of the later law schools of Palestine and Babylon. In fact, Gamaliel himself at several points modified the restrictive customs of Jewish exclusivism and Jewish Sabbatism, while he protected the interests of wives in the matter of divorce, and the interests of fatherless children in the matter of inheritance. He was even liberal enough to be a student of Greek literature, which was held in abhorrence by narrow-minded rabbis. In view of these facts it is not difficult to understand his tolerant position in the Sanhedrin council of Acts v., though it is to be doubted whether any appreciation of Christianity entered into his motives, the legend of his subsequent conversion to the Christian faith being worthless. It is also not difficult to understand the attraction to him of Saul of Tarsus: though the fact that Saul afterwards became a persecutor has been made a ground for denying the historicity of the narrative in Acts v., or the actuality of any

relations between him and Saul. The development of one of his pupils in fanatical directions, however, may after all be due more to the pupil's unique surroundings and their influence upon his growing conviction that salvation was by works, rather than to any inherent bigotry of spirit within the pupil that would make unlikely instruction at such a teacher's feet. Gamaliel died evidently some time before 70, since his son Simon was then in public life, while he himself seems to have been forgotten. Many traditions are ascribed to him which belong to his grandson, Gamaliel II., with whom he is constantly confused.

GAMARRA, gā-mār'rá, AGUSTÍN (1785-1841). A Peruvian soldier and politician, born at Cuzco. He studied there at the College San Buenaventura, and rose to be a lieutenant-colonel in the Spanish Army, but in 1821 entered the Patriot service, and became successively general and grand-marshal. In 1829, after the deposition of General Lamar, he was inaugurated as President of Peru. His administration, not wholly a successful one, closed in 1833. In 1834 he became a leader in the insurrection against his successor, Orbegoso, but afterwards escaped to Bolivia. He subsequently fought under Santa Cruz (q.v.) and Salaverry, and in 1835 was banished by the latter to Costa Rica for an attempt to incite revolt. When war was declared between Chile and the Peru-Bolivian Confederation formed by Santa Cruz, he commanded the reserve of the Chilean army sent to invade Peru, and after the defeat of the troops of the Confederation in 1839, near Yagay, was declared Provisional President. He was elected Constitutional President by Congress with the title of 'Restorer,' and obtained the abolition of the liberal Constitution of 1834. In 1841 he declared war against Bolivia, commanded the army of invasion, and was killed at the defeat of Yngavi (November 20). Despite frequent tyrannical acts, he appears to have sought the progress of his country. In 1849 a mausoleum was erected in his honor in the Pantheon of Lima.

GAMBA, gām'bā, BARTOLOMEO (1776-1841). An Italian bibliographer, born at Bassano. He gave himself entirely to the study of the literature of Italy, and for many years was vice-librarian of Saint Mark's, Venice. His works include: *Serie dei testi di lingua* (1808, 4th enlarged edition, 1839); *Galleria dei letterati ed artisti delle provincie venete nel secolo XVIII* (1824); *Vita di Dante* (1825); *Catalogo delle più importanti edizioni della Divina Commedia* (1832); and *Bibliografia delle novelle italiane in prosa* (1833).

GAMBARELLI, gām'bā-rē'lē. The family name of five brothers, who were architects and sculptors in Rome during the early Renaissance. The two foremost, Antonio and Bernardo, are best known by their surname, Rossellino (q.v.).

GAM'BESON, or **WAMBAIS** (AS. *wamb*, from OF. *gambeson*, *wambaison*, from ML. *gambeso*, *wambasium*, from OHG., Goth. *wamba*, stomach, Eng. *womb*). In mediæval armor, a protection for the body, composed of layers of cloth, tow, or similar material, quilted on a lining canvas or leather. It was worn by the infantry as their only defense, and by knights under their mail shirts.

GAMBETTA, *Fr. pron. gǎn'bǎ'tǎ'*, LÉON (1838-82). A French statesman. He was born April 3, 1838, at Cahors, of a family which had come originally from Genoa, and which is said to have been of Jewish origin. In 1859 he began the practice of law at Paris, and soon made his mark as counsel for defendants in political prosecutions, showing himself an able and determined opponent of the Second Empire. He was returned to the Chamber of Deputies from Paris and Marseilles in the elections of 1869, and on May 5, 1870, he delivered a speech containing a panegyric of the republican form of government, which attracted great attention. After the disaster of Sedan and the fall of the Empire he became Minister of the Interior in the Provisional Government, and remained for some time in Paris after it was invested by the Germans. In order to arouse the provinces, he escaped from the city in a balloon, October 7, proceeded to Tours, and established a virtual dictatorship. With untiring energy he organized resistance to the invader, putting three great armies into the field for the relief of the capital, and calling upon the nation to rise *en masse*. He urged his countrymen to fight to the bitter end, and denounced the capitulation of Metz as an act of treason on the part of Marshal Bazaine. When a National Assembly was resolved upon in 1871 Gambetta sought to give it an exclusively republican character by a decree directing that no official of the Second Empire should take part in the election. The decree was canceled at the instigation of Prince Bismarck, and Gambetta resigned office, February 6, 1871. He subsequently entered the Assembly as a member for Paris, and became the leader of the Extreme Left, violently attacking the monarchical parties. After the retirement of M. Thiers his political action became more moderate. The Republicans owed to his leadership their success in the elections of 1877, and their defeat of the attempts of the Conservatives to deprive them of its results. In the same year he was twice prosecuted for violence of speech, and once condemned to imprisonment. On the election of Jules Grévy to the Presidency of the Republic in 1879, Gambetta became president of the Chamber of Deputies, January 31.

Upon the fall of the Ferry Ministry in November, 1881, Gambetta was asked to form a new Cabinet. Prevented by Léon Say and others from bringing the various factions of the Republic together by giving the representatives of each a place in the Ministry, he startled the nation by a selection which it could not but regard with apprehension and alarm. The Roman Catholics were directly insulted by the choice of Paul Bert, an open skeptic, as Minister of Public Worship. The Conservatives, agitated by his proposed curtailment of the powers of the Senate, joined with the Church in opposing his policy. The Extreme Left also had reasons for opposition. At an early date Gambetta reintroduced his favorite schemes of *scrutin de liste* (q.v.) and Senatorial abridgment. The Lower Chamber was to share in the election of Senators, and the vote of the latter upon financial measures was to be taken away. The *scrutin de liste* was defeated and Gambetta immediately resigned (January 14, 1882). Although his influence over national affairs was

still felt through his newspaper, the *République Française*, he seldom appeared in public after his resignation. The Republicans, who had not wholly trusted him while in power, were thrown into confusion by the news of his death, as it deprived them of the one man whose strong opposition the Royalist and Bonapartist factions especially feared. A pistol wound in the hand aggravated a malady from which he had long suffered, and he died December 31, 1882. Gambetta's *Discours et plaidoyers* have been edited in 11 volumes by Reinach (Paris, 1881-85). Consult: Reinach, *Léon Gambetta* (Paris, 1884); Tournier, *Gambetta* (Paris, 1893); Harrison, *Léon Gambetta, a Positivist* (London, 1892); Coubertin, *The Evolution of France Under the Third Republic*, translated by Hapgood (New York, 1897). See FRANCO-GERMAN WAR.

GAMBIA. A British colony in Northwestern Africa, at the mouth of the river of the same name (Map: Africa, C 3). Its area is only 69 square miles, but it lies adjacent to territory under British protection, with an area of 4500 square miles. The principal exports are ground-nuts, hides, beeswax, rice, cotton, and india-rubber. The trade of the colony shows a rapid growth for the last few years, the exports having increased from £93,500 in 1895 to £281,970 in 1900, while the imports had risen from £97,700 to £277,659 during the same period. The population in 1901 was 13,500, while that of the adjacent protected territory is estimated at 77,000. Of the population of the colony only 193 are whites. There are 7700 Mohammedans and 3540 Christians. The principal town is Bathurst (q.v.). Gambia was included in the British West African Settlements from 1866 until it was constituted a separate colony in 1888.

GAMBIA (African *Ba-diman, Fourci*). A river of West Africa, rising in the mountains of Futa-Jallon, Senegal, and flowing through the British colony of Gambia (q.v.) (Map: Africa, C 3). It falls into the Atlantic at Bathurst by a wide estuary. There is a bar a short distance from its mouth, which obstructs navigation at low tide. The total length of the river is estimated at over 700 miles. The lower part of the river flows through a swampy region. Sea-going steamers ascend as far as Fort George, about 170 miles, while lighter vessels reach the Barraconda Rapids, about 220 miles from its mouth. The river incloses a number of islets.

GAMBIER'. A village in Knox County, Ohio, 50 miles northeast of Columbus; on the Cleveland, Akron and Columbus Railroad (Map: Ohio, F 5). It is the seat of Kenyon College (q.v.), Kenyon Military Academy, Harcourt Female Seminary, and Bexley Theological Seminary. Population, in 1890, 660; in 1900, 751.

GAMBIER, JAMES, Lord (1756-1833). An English admiral. He was born at New Providence, Bahamas, October 13, 1756, while his father was lieutenant-governor of the islands. He entered the navy in 1767, was post-captain in 1778, and in 1780 took part in the capture of Charleston, S. C. He commanded the *Defence* in the battle off Ushant in June, 1794, and was the first to break through the French line. He received a gold medal for his services, and was made colonel of the marines. The following year he be-

came rear-admiral and a Lord of the Admiralty. In 1799 he was made vice-admiral. In 1802 he was appointed Governor of Newfoundland and commander-in-chief of the naval station. In 1804 he returned to the Admiralty, and in 1805 attained the rank of admiral. For his share in the bombardment of Copenhagen and the capture of the Danish navy in 1807 he was raised to the peerage as Lord Gambier. In command of the Channel fleet he blockaded the French fleet in Aix Roads, but did not support Cochrane. Lord Dundonald, whom the Admiralty had deputed to destroy it. When Cochrane complained, Gambier demanded a trial, and received a qualified acquittal by a friendly court-martial. As a chief commissioner he took part in the peace negotiations of the United States at Ghent in 1814, and for this service was nominated G. C. B. In 1830 he was promoted to be Admiral of the Fleet. He died April 19, 1833.

GAMBIER ISLANDS. A small group of islands in the Pacific, situated in latitude 23° 8' S., and longitude 134° 55' W. (Map: Australia, F 6). They number seven, all of coral formation, and cover an area of about twelve square miles. They are all elevated, well wooded, and have a good supply of fresh water. The chief products are sugar, bananas, coconuts, etc. The largest island of the group is Mangareva, with a good harbor. The group is under French protection, and has a population of nearly 600 inhabitants, who are of Raratongan origin, and Roman Catholics.

GAM'BIR (Malay), *Terra japonica*. A crystalline plant extract similar to catechu (q.v.). Like catechu, it is largely used in tanning and dyeing, and it is used medicinally as an astringent. It is obtained from the leaves and young twigs of *Uncaria gambir*, which is extensively cultivated at Singapore. To prepare it, the leaves and twigs are extracted by boiling, the solution evaporated to sufficient thickness, cast into small cubes, and allowed to harden. Gambir is mainly used in England.

GAM'BLE, HAMILTON ROWAN (1798-1864). An American statesman, 'War' Governor of Missouri. He was born at Winchester, Va., studied at Hampden-Sidney College (Farmville, Va.), was admitted to the Virginia bar, and from 1818 resided in Missouri. In 1823 he was elected Secretary of State of Missouri. Subsequently he acquired an extensive legal practice at Saint Louis, and rose to be presiding Judge of the State Supreme Court. He was elected in 1861 to the Missouri Constitutional Convention, and when on July 31st that body established a Provisional Government, he was appointed Governor to replace Claiborne F. Jackson, who had joined the Secessionists. In 1862 he issued an order commanding the enrollment of the total fighting population, and giving authority to General Schofield to place in active service a force adequate to the maintenance of peace. This order occasioned an uprising among the partisans of the South, who looked upon it as a draft measure, and believed that in having given oath not to take up arms against the State or Federal Government they had become non-combatants. On June 15, 1863, at the summons of the Governor, a convention assembled which adopted an ordinance providing for a method of gradual emancipation of slaves. This did not satisfy the ultra-Republicans, who

demanding an immediate emancipation, and thereby gained the election of November, 1864.

GAMBLING, or **GAMING** (from AS. *game-nian*, *gamen*, *gomen*, game, sport, joy). The art or practice of playing a game of hazard, or one depending partly on skill and partly on hazard, with a view to pecuniary gain. Games of this nature were forbidden by the Romans, both under the Republic and the Empire. The ground on which this was done was not the tendency of such practices to demoralize the populace, but to render them effeminate and unmanly. It belonged to the *adiles* to attend to the public interest by punishing violations of the gaming laws. During the Saturnalia, which was a period of general license, these games were permitted, and a like indulgence at other seasons was extended to old men both among the Greeks and the Romans. Nor has this vice been confined to civilized nations, either in the ancient or the modern world; Tacitus mentions its existence among the ancient Germans, and it is known to prevail among many half-civilized and even savage tribes at the present day.

It is remarkable that in England, as in Rome, the ground on which gambling was first prohibited was not its demoralizing, but its effeminating, influence on the community. The act 33 Henry VIII., ch. 9 (1541) had in view the double object of "maintaining artillery and debarring unlawful games." On that act followed 16 Charles II., ch. 7, and 9 Anne, ch. 14, the latter of which declared that all bonds or other securities given for money won at play, or money lent at the time to play with, should be utterly void, and all mortgages or incumbrances of lands made on the same consideration should be made over to the use of the mortgagor. Such continued to be the statute law till 1845, when there was passed the act 8 and 9 Vict., ch. 109, which, though it repealed the obsolete provisions of 33 Henry VIII., and 16 Charles II., and 9 Anne, reenacted the former prohibitions against card-playing and other games, and was followed up (in 1853 and 1854) by the acts for suppressing betting houses (16 and 17 Vict., ch. 119) and gaming houses (17 and 18 Vict., ch. 38). By 8 and 9 Vict., ch. 109, the common law of England was altered, and wagers, which, with some exceptions, had hitherto been considered legal contracts, were declared to be no longer enforceable in a court of law. This prohibition does not affect contributing to prizes for lawful games. In Scotland an opposite rule had been followed, the judges having held, irrespective of the character of the game, or of any statutory prohibition regarding it, that "their proper functions were to enforce the rights of parties arising out of serious transactions, and not to pay regard to *sponsions ludicras*." But partial assimilation has now been effected in this respect between the laws of the two countries by a statute, which also provides that cheating at play shall be punished as obtaining money under false pretenses. The mode of enforcing the act 8 and 9 Vict., ch. 109, was defective, and the act 17 and 18 Vict., ch. 38, put heavy penalties on those who obstructed the police by putting chains or bolts against the doors of gaming houses or otherwise delaying the entry into such houses, and any apparatus or arrangement for giving alarm to the persons inside was declared to be evidence that the house was a gaming house. The Sum-

mary Jurisdiction acts of 1879 and 1884 have provided summary remedies against the violators of gaming laws. The Betting-Houses Act (16 and 17 Vict., ch. 119) was passed to put down another kind of gaming—namely, in houses where money is received as or for the consideration for any undertaking to pay money in the event of any horse race, or other race, fight, game, sport, or exercise. All such betting houses are declared to be gaming houses within the statute 8 and 9 Vict., ch. 109, and similar powers of search may be resorted to. But nothing in the act extends to a person holding stakes to be paid to the winner of any race or lawful sport, game, or exercise. Besides these statutes, the Intoxicating Liquors Licensing Act of 1872 puts a penalty on the keeper of any house for the sale of liquors allowing any gaming for money or money's worth on the premises. By the vagrant acts all persons are liable to penalties for playing at games on a public highway or public place. These enactments do not interfere with gaming in private houses.

In most of the States of Germany gaming was allowed, and the extent to which it was practiced at the German watering places is well known. The princes of the petty States often derived a large portion of their revenue from the tenants of their gaming establishments, whose exclusive privileges they guaranteed. Recently these German gaming tables have all been closed. Monaco has now the chief public gaming tables of Europe.

In the United States, as in England, one who keeps a gambling house is indictable at common law for maintaining a nuisance; and one who wins another's money with false dice, or the like, is punishable as a common-law cheat. Legislation in our States against gambling has taken a course similar to that above described in Britain. The tendency has been toward greater precision in defining the offenses of gambling and of keeping gambling houses and implements, toward more summary methods of dealing with the violators of these statutes, and toward severer punishment of violators. Such legislation is so diverse in matters of detail as to render even an outline of it impracticable. There has been difficulty in arriving at a correct definition of gambling. It cannot be said that a mere contest of skill or strength, however great may be the prize, is indictable at common law, for in England and the United States such contests have at all times been sanctioned by public policy and protected by the courts. Of course there may be contests not objectionable upon this ground which may be prohibited for other reasons, as, e.g. cock-fighting, which is properly regarded as a cruel and wanton sport. But it is 'gaming' for persons to stake money on chance. The chance must be the controlling factor in the game. It is not enough that chance should enter into a contest to make it gambling, for it cannot be denied that there is a certain element of fortune in almost any contest or undertaking. But this does not make such contest gambling. All competitive examinations are affected somewhat by chance, yet no competitive examination is gambling. So in games of skill, as chess and billiards. In such games chance may have very little part. If so, playing these games, even for a prize or reward, is not gambling. It is otherwise when the game depends more largely on chance than on skill; so that it may be said that gambling as a penal

offense, under the statutes making it such, may be defined as a staking on chance. Consult: *Encyclopædia of the Laws of England* (London, 1897-98); Bishop, *On Statutory Crimes* (3d ed., Chicago, 1901).

GAMBOGE, gām-bōōj', or -bōj', or **CAMBOGE** (from *Camboja*, *Cambodia*, Skt. *Kambōja*, where the tree abounds). A gum resin brought from the East Indies, and believed to be the produce chiefly of *Garcinia Cambogia*, also known as *Garcinia cambogioides*, a tree of the natural order Guttiferae, a native of Ceylon, Siam, Cambodia, etc. The gamboge-tree attains a height of forty feet, has smooth oval leaves, small polygamous flowers, and clustered succulent fruit. When the bark of a tree is wounded, gamboge exudes as a thick, viscid, yellow juice, which hardens by exposure to the air. The finest gamboge comes from Siam. *American gamboge*, which is very similar, and used for the same purposes, is obtained from *Vismia Guianensis* (natural order Hypericinea), a native of Mexico and Surinam. Gamboge occurs in commerce in three forms: (1) In rolls or solid cylinders; (2) in pipes or hollow cylinders; and (3) in cakes or amorphous masses. The first two kinds are the purest. Good gamboge contains about 70 per cent. of resin and 20 per cent. of gum, the remainder being made up of woody fibre, fecula, and moisture. The resin of gamboge, known as gambogic acid, is a bright yellow substance soluble in alcohol and in ether. Its composition is represented by the formula $C_{40}H_{20}O$. It is much used by painters to produce a beautiful yellow color. It is also employed for staining wood, and for making a gold-colored lacquer for brass. It has a shelly fracture, is destitute of smell, and has an acrid taste. If taken internally, it acts as a cathartic, producing a large amount of secretion. It is but rarely used in medicine, and never alone, as it causes griping and irritation of the alimentary canal. See MANGOSTEEN.

GAMBRI'NUS. A mythical king of Flanders, to whom is ascribed the invention of beer. His figure is familiar in German beer-cellars and elsewhere, seated astride a cask with a tankard in his hand. The name is said to have arisen out of that of Jan Primus, Duke of Brabant (1251-94). He obtained the presidency of the Brussels guild of brewers, and his portrait, with a foaming glass of beer in his hand, was hung up in the hall of the guild. The name was presumably converted into German, the prince of the story made a king, and the invention of beer ascribed to him. But this explanation is probably itself a fiction.

GAME. See HUNTING.

GAME FOWL. See FOWL; COCK-FIGHTING.

GAME LAWS. Statutes enacted either for the purpose of protecting persons in the enjoyment of certain sporting rights, or of protecting game from improper destruction.

Previous to the Norman Conquest of England there were no restrictions against the hunting of game, except a general law prohibiting the hunting of game on Sundays; so far as is known this was the earliest game law. A subsequent law prohibited monks hunting in the woods with dogs. All other classes of society were at liberty to hunt over the country at large, except that the King's hunting was not to be interfered with;

that is, wherever the King elected to hunt, all others had to vacate until the King and his followers had passed. With the advent of the Normans in 1066, hunting became the sole privilege of the nobles, and the common people were prohibited, under severe penalties, from the hunting of game. They enacted stringent game laws, which became known as the Forest Laws, and which frequently drove the Saxons, and common people generally, into rebellion. Many of them, as in the case of the historic Robin Hood, became outlaws. During the Middle Ages the game laws of England were framed so as to secure to the landed aristocracy the exclusive right of taking game. Under their provisions, according to Blackstone, "All persons of what property or distinction soever, that kill game out of their own territories, or even upon their own estates, without the King's license expressed by grant or franchise, are guilty of the offense of encroaching on the royal prerogative. And those indigent persons who do so without having such rank or fortune, as is generally called a qualification, are guilty not only of this offense, but of the aggravations also created by the statutes for preserving game." One of the 'qualifications' for killing game in Blackstone's time was the ownership of a freehold estate of £100 per annum, "there being fifty times the property required to enable a man to kill a partridge," remarks the great commentator, "as to vote for a Knight of the Shire." Early in the last century all the old statutes on the subject were repealed, and the Night Poaching Act, 1828 (9 Geo. IV., ch. 69), and the Game Act, 1831 (2 Wm. IV., ch. 32), were substituted for these. These laws define game as hares, pheasants, partridges, grouse, heath or moor game, blackgame, and bustards." Later statutes have added to the list "landrails, quail, snipe, woodcock, rabbits, and deer." These enactments give to the occupier of land the civil remedies of trespass and injunction against persons entering his land to kill game, or shooting into it for such purpose. They also impose criminal punishment for various violations of their provisions, such as deer-stealing, taking of game at night, poisoning game, and the like.

In the United States game laws have been framed on different lines from those of England. Their primary object has been the protection of game itself, not the grant of exclusive rights to persons possessed of large property qualifications. In 1623 Plymouth Colony declared fowling, fishing, and hunting to be free, except on certain private property. In 1682, in this same colony, "the law prohibiting the catching of fish before they have spawned is to be revived by the commissioners at their next session." In 1709 it was enacted that "no weirs, hedges, fish-garths, stakes, kiddles, or disturbance or incumbrance, shall be set, erected, or made on or across any river, to the stopping, obstructing, or straitening of the natural or usual course and passage of fish in their seasons or spring of the year." In these laws are embodied the principles which are the basis of all just and reasonable game laws, and they are the corner-stones and foundations of all the statutes for the protection of fish and game that are in force in the States and Territories today. Class legislation is dead; all wild game and fishes are the property of him that reduces them to possession by killing or catching, with due regard to the law of trespass on private prop-

erty, be it land or water; wild game and fishes must not be molested during the season of reproduction, and they must be allowed free and unobstructed passage to their breeding grounds or waters.

The rule governing the acquisition of property in game in this country differs in some respects from those in England. There, if a hunter captures game upon the land of another, it belongs to the landowner, while here it belongs to the captor, although he may be liable to an action for trespass, and in some States to a criminal prosecution, for entering upon the premises of another without permission. By the common law the right of fishing in the sea and in tide-waters generally is public and common to every person; but the owners of lands on the banks of fresh-water rivers above the tide line have the exclusive right of fishing to the middle of the stream. If the same person owns lands on both sides of the river, he has the sole right of fishing in the river as far as his lands extend. So the sole right of fishing in ponds or lakes belongs to him who owns the fee of the soil beneath the water. Moreover, a person rightfully navigating a river becomes a trespasser when he shoots at or kills wild ducks thereon, in case the bed of the river is the property of adjacent land-owners.

This right of fishery, however, is not an absolute or unqualified right of property. It is subject to the police power of the State. Persons may be prohibited by legislation from fishing or hunting even upon their own lands, during certain seasons, and their sale of game which has been killed during the open season may be regulated. This rule rests upon the doctrine that the wild game within a State belongs to the people in their collective sovereign capacity. It is the subject of private ownership only so far as the people may elect to make it so; and they may absolutely prohibit the taking of it, or traffic and commerce in it, if this is deemed necessary for the protection or preservation of the public good. Hence State laws prohibiting the citizens of other States from planting oysters within the tide-waters of the enacting State are constitutional. So are laws regulating the catching of fish within the bays of the enacting State, or prohibiting the catching of fish or the killing of game for the purpose of carrying the same beyond the limits of the State. All State laws having for their object the protection of game from unnecessary slaughter, and the propagation of game, have been treated with favor by both State and Federal courts, and have received a liberal construction. Indeed, the Supreme Court of the United States has not hesitated to declare that it is the duty of the Legislature to enact such laws as will best preserve game of every kind and secure it as a valuable food-supply for the future use of the people of the State. Even the sale of fish propagated in private ponds may lawfully be restricted during the close season. Such restriction, the Supreme Court of Massachusetts has decided, does not differ in principle from forbidding persons from catching fish in streams running through their own lands. In short, the right to take game is a boon or privilege rather than a vested legal right.

Modern game laws do not stop with prohibitions against killing game out of season. They extend to the sale of such game, and even to its

possession, during the period of prohibition. They have become more stringent and minute in their restrictions. The machinery for the enforcement of this provision is far more effective than formerly, and civil suits for heavy fines are more frequently resorted to than criminal prosecutions under indictments.

The lack of uniformity of the various State laws dictating the seasons during which birds and animals shall be protected frequently defeats the very purpose for which the laws were framed, and, moreover, makes compliance with the provisions of the Federal law difficult for both shippers and game dealers, who have to consider the open seasons in the State in which the game was killed, and that to which it is their purpose to ship it. Still more confusion is caused by the general diversity in defining the seasons. In some States the open seasons are given, and in others the closed; while in all their statements is to be found every possible variety of inclusion and exclusion of the dates named. In some States the regular killing season is checked by the prohibition of shooting or killing on certain days of the week.

SHIPMENT OF GAME. This also is an important subject of game legislation, for one of the greatest factors in the rapid destruction of game in recent years has undoubtedly been the illegal shipment of game from one State to another. It has also been an exceedingly difficult problem to cope with, largely because interstate commerce is outside the jurisdiction of the several States. There was passed by Congress on May 25, 1900, an act, popularly termed the Lacey Act, which gave to the Secretary of Agriculture all duties and responsibilities connected with the preservation of game, and at the same time prohibited interstate commerce in game killed in violation of local laws. The Lacey Act is based, to a modified degree, on State laws, so that its proper enforcement requires a knowledge of certain local provisions which are subject to periodical change. Section 4 of this act ordains that every package containing game animals or birds, when shipped by interstate commerce, must be clearly marked, so as to show the name and address of the shipper, as well as the nature of the contents. In addition to this the laws of Colorado, Connecticut, Michigan, Nebraska, Ohio, Oregon, Wisconsin, New Brunswick, and Ontario require packages of fish or game to bear a statement clearly indicating the nature of the contents, which must cover the *kind* of game and the *amount* in the package. The majority of the States prohibiting exports place no restrictions on shipments within the State; six States, however, absolutely prohibit all shipment, as Tennessee, quail; Texas, domestic game; Minnesota, most game birds; Kansas, all protected game; Nevada, big game; and New Hampshire, moose, caribou, and elk; other States impose various limitations ranging anywhere between the two extremes. An important event in the development of modern State laws was the establishing by the Supreme Court of the constitutionality of the Connecticut statute prohibiting export of certain game. (*Geer vs. Connecticut*, 161 U. S. 519.) As a result, non-export laws have been generally adopted throughout all the States, nearly every State prohibiting the export of certain kinds of game. Kentucky, Mississippi, and Virginia are the only exceptions.

In some States the sportsman may carry a limited amount of game out of the State, but only under special restrictions. Deer may not be lawfully exported from Alabama, Florida, or any of the States or Territories west of the Mississippi, except Montana, Kansas, and Iowa; any of the States north of the Ohio and Potomac rivers, except Illinois, Ohio, Delaware, New Jersey, Connecticut, Rhode Island, and Massachusetts; while in Montana they cannot be sold, and in Illinois, Iowa, New Jersey, Connecticut, Rhode Island, and Massachusetts they are protected indefinitely at all seasons, or else for a definite term of years. The most general prohibition among game birds is that against the export of quail, which, with six exceptions, is in force in every State and Territory of the Union.

Across the border, Canada has a general law, covering and prohibiting the export of wild turkeys, partridge, prairie-fowl, quail, woodcock, and deer, except in the case of deer raised on private reserves; and an exception which provides that non-resident sportsmen may export two deer each in a calendar year at certain ports of export within fifteen days after the close of the open season. Such ports are Halifax and Yarmouth, in Nova Scotia; MacAdam Junction, New Brunswick; Quebec and Montreal, in Quebec; Ottawa, Kingston, Niagara Falls, Fort Erie, Windsor, Sault Ste. Marie, and Port Arthur in Ontario; and such other ports as the Minister of Customs may, from time to time, designate.

LICENSES FOR HUNTING AND SHIPPING GAME. In some sections of the United States, as Louisiana and Missouri, non-residents are denied the privilege of hunting, while the same class is denied the right to kill game in certain parts of the State of Virginia. Throughout Canada, and in twenty-five of the States of the Union, non-residents may hunt certain game providing they have secured a license. In nine States a similar restriction is imposed on residents, but the fee is usually nominal, and in all cases considerably less than that imposed on non-residents.

With regard to *fishing*, both for food and game fishes, all that has been said on the subject of hunting also applies. Most of the States have their own laws regulating the fishing for food and game fish—the open seasons varying according to the State and the species of fish. In some States it is illegal to take fish under a certain size or weight, while in most it is forbidden to take trout, bass, and other fish by netting or spearing, or by any method other than with hook and line. The laws apply to fishing in private waters as well as in those that belong to the State.

TRESPASSING. The same laws govern trespass in fishing as in hunting, although some States have made special laws on the subject. As a rule, however, the general law throughout the States on this subject decides that if the bottom of a lake or stream is subject to private ownership, the owner has the sole right of fishing, even though the water is deep enough to float a boat, and is subject to public use as a highway. In public waters the right belongs to the State, and consequently is usually free to the public, although there are instances where the State grants it to particular persons.

Below will be found tables giving the open and closed seasons for the more important varieties

of game—fish, bird, and animal—and a comprehensive bibliography:

GAME.

Deer.—The month of May is a closed season throughout the country; the regular closed period in each State ranging from the entire year, except December, in Minnesota, to May, June, July, and August, in New Mexico.

Wild Turkey is protected during May, June, July, and August throughout all the States.

Quail is slightly better protected than the wild turkey.

Grouse, including *Prairie Chicken* and *Pheasant*, is generally protected in the Northern and Eastern States, except during the months of November and December. In the Southern and Southwestern States the open season is, as a rule, during December, January, and February.

Wild Water Fowl enjoy a closed period varying from one to three months.

Rail and Woodcock are protected most of the first half of the year, and in New York and New England generally, during the month of December. The following also enjoy periods of immunity, varying according to State legislation: Hares, Rabbits, Plover, Snipe, and Squirrels; also Elk, Moose, Antelope, Buffalo, Mountain Sheep. Among *water animals*, the Beaver, Mink, Otter, Muskrat, Sable, Fisher, and Marten.

See *FERÆ NATURE*; *FISHING LAWS*; etc. Consult: *Geer vs. Connecticut*, 161 United States Reports, 517 (1896); *Commonwealth vs. Gubert*, 160 Massachusetts Reports, 157 (1893); *Year Book of the Department of Agriculture*, 1899, pp. 282-287; id., 1901, pp. 634, 635; Oke, *Handy Book of the Game Laws* (4th ed., London, 1897).

GAMELYN, gām'e-līn. The hero of an English verse tale of the same name written in the fourteenth century. It was formerly ascribed to Chaucer, for the reason that all extant copies of the poem are found in the MSS. of the *Canterbury Tales*. It is interesting as furnishing Thomas Lodge with an outline for the first part of *Rosalind*, upon which Shakespeare afterwards based *As You Like It*. Consult the appendix to the *Variorum* edition of Shakespeare's play by Furness (Philadelphia, 1890).

GAME OF CHESS, A. A political comedy by Thomas Middleton, satirizing Spain and Roman

FISH ARE OUT OF SEASON DURING THE FOLLOWING MONTHS.

Except where there is only one mark, in which case only part of the month is closed, and the part left blank is open.

	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
MUSCALONGE												
Dakota.....												
New Hampshire.....												
BLACK BASS												
Dakota.....												
Illinois.....												
Maine.....												
Massachusetts.....												
New Hampshire.....												
New York.....												
Rhode Island.....												
Vermont.....												
Wisconsin.....												
BLUEFISH												
In Southern waters.....												
In Northern waters.....												
SALMON												
California.....												
Illinois.....												
Iowa.....												
Maine (with hook and line).....												
Maine (in all ways).....												
Massachusetts.....												
Ohio.....												
Pennsylvania.....												
West Virginia.....												
TROUT												
California and Oregon.....												
Connecticut.....												
Illinois.....												
Iowa.....												
Maine (by citizens).....												
Maine (by others).....												
Maryland.....												
Massachusetts and Minnesota.....												
Michigan and New York.....												
New Hampshire (with hook and line).....												
New Hampshire (in any way).....												
New Jersey.....												
New Mexico.....												
North Carolina, west of the Blue Ridge.....												
Ohio.....												
Pennsylvania (speckled).....												
Pennsylvania (lake).....												
Rhode Island.....												
Vermont.....												
West Virginia.....												
Wisconsin.....												
PERCH												
Maine.....												
New Hampshire.....												
PIKE AND PICKEREL												
Dakota.....												
New Hampshire.....												
Pennsylvania.....												
Vermont.....												

Catholicism, produced at the Globe Theatre in August, 1624, and published in quarto the same year. It was suggested by the notorious Spanish Match, and drew much of its abundant detail from contemporary tracts which dealt with that fiasco. The Spanish Minister immediately protested to King James concerning it, and the author was temporarily imprisoned. The vogue which the play enjoyed at the time was remarkable, its nine performances netting £1500. Consult Doran, *English Stage*.

GAME PRESERVE. A park stocked with game, or a tract of country, sometimes inclosed, and set apart for the protection of game. At the beginning of the Middle Ages the rulers of European countries maintained their own hunting grounds or forests, a fashion which was soon followed by the landed nobility, and out of which grew up the present system, by which the right of hunting and the ownership of game is vested in the ownership of the land. (See **GAME LAWS**.) Austria-Hungary and Germany contain many 'hunting estates,' as also did France before the Revolution; and game of every description is plentiful. In none of these countries, however, is the preservation of game so much a concern of the National Government as of the individual proprietor. In the British Isles game preserving has attained a high degree of development; but, as in Continental Europe, it is due to the individual land-owner rather than to the Government, and the impelling factor is a selfish rather than a patriotic motive.

In England and Scotland the old method of shooting birds over dogs has been largely superseded by 'driving.' Instead of hunting the game, the sportsmen or 'guns' take up previously appointed positions, and the 'beaters' or game-keepers drive the game in front of the gunners. Vast sums are annually expended in breeding the different varieties of game; but as they are practically raised in captivity, they are as a rule heavy on the wing, and lacking in the characteristics most desired by the keen hunter. Within recent times fresh-water fish have come under Government protection, local as well as national.

In Ireland the impoverished condition of the great majority of the land-owners has prevented the stocking and breeding of game to any great extent; nevertheless there are several estates in the midlands, south, and west, where game is carefully preserved for sporting purposes.

Scotland possesses the largest single areas set apart for shooting and hunting in the United Kingdom, the preserve of the Duke of Sutherland ranking as one of the largest in the world. The vast tracts set apart for these purposes have become a very real grievance to the Scottish people. Grouse, deer, and salmon are especially preserved in Scotland.

In the United States the subject of game preservation in its largest sense has become a matter of national legislation. Every effort is being made to preserve what is left of the bison, the Maine caribou, the bald eagle of the Rockies, and the ibis and the flamingo of the extreme southern forests. Besides the numerous zoölogical gardens throughout the country, and the various Government reservations, there are many estates owned by private individuals or by private clubs. One of the oldest of these latter is that founded by Fayette S. Giles in 1870, which covers 17,000 acres, and is known as the Grove Park Associa-

tion. The first real game preserve in America was that of Judge John Dean Caton, the author of *The Deer and Antelope of America*, who founded his preserve for the purpose of sport as well as for study. The Litchfield tracts at Tupper Lake, N. Y., and the Webb holdings at Nehasane, N. Y., and Shelburne, Vt., are also well-known game preserves. Corbin Park at Newport, N. H., next to the Duke of Sutherland's estate, is the largest inclosed game preserve in the world; the latter, however, exceeds it only in superficial area, and not by any means in scope or importance. The Corbin tract consists of more than 25,000 inclosed acres, with additional land outside, and includes altogether nearly four entire townships. An important game fish preserve is that of E. C. Benedict, in Connecticut, at the east end of Long Island Sound. The most important private game preserve in the United States is that of G. W. Vanderbilt at Biltmore, N. C., which covers 80,000 acres of diversified country, of which 6000 acres are inclosed and the remainder open. The preserve is cared for by an organized system of rangers, keepers, etc. Private game preserves are becoming plentiful in the Adirondacks, but the interests of the general public are being cared for there as in other places throughout the country by the creation of Government reserves, both forest and game. See **FORESTRY**.

Canada has several big preserves, but throughout eastern and central Quebec the best stretches of game country land and water are all owned by private individuals. A famous preserve is the great Caughnawaga tract, which is situated north of Deux Rivières, on the Magnacippi River. The preserve of the Roberval Club, which has a mixed Canadian and United States membership of over 300, is in the heart of the Laurentian Mountains, and is a little over 500 square miles in extent. The most remarkable preserve is that belonging to Henri Ménier, consisting of the whole of Anticosti Island, in the Gulf of Saint Lawrence. See **FISHING; HUNTING**.

GAMES, ANCIENT. The public games of Greece and Rome were athletic contests and spectacles of various kinds, generally connected with religious observances. It is hard to overestimate the influence of the public contests of Greece in developing the extraordinary appreciation of physical beauty among the Greeks, and its reflection in art and literature. They also exercised a powerful influence in promoting a feeling of national unity in opposition to the many rivalries which tended to disrupt the Grecian world. As the contests came to take on more and more of the professional character, the admiration for the athletes decreased, and the games lost much of their early character. In the Homeric poems we find games a part of the funeral of a great chief, but with the fall of the nobility they become associated with some special sanctuary or religious festival. The Romans preferred to play the part of spectators, and their shows were commonly gladiatorial and bloody—things entirely foreign to the feeling of free Greece. See **OLYMPIC GAMES; PYTHIAN GAMES; NEMEA; ISTHMUS; PANATHENÆA; CIRCUS; AMPHITHEATRE; GLADIATOR**.

GAMESTER, THE. (1) A comedy by Shirley (1633). It is founded on a novel by Celio Malespini, and in its turn suggested Johnson's

The Wife's Relief (1711); Garrick's *The Gamesters* (1758); and Poole's *The Wife's Stratagem* (1827). Charles I. approved it highly, and is said to have even assisted in the construction of its plot. (2) A comedy by Mrs. Centlivre (1705). It was taken from Regnard's *Le joueur* (1696), and suggested Destouche's *Le Dissipateur* (1736). (3) A bourgeois tragedy in prose by Edward Moore, produced with success at Drury Lane, February 7, 1753. Garrick wrote the scene between Lewson and Stukely in the fourth act, and played the principal part.

GAM'ETANGIUM (Neo.Lat., from Gk. γαμέτην, *gametē*, wife + ἀγγεῖον, *angeion*, vessel). The organ of plants in which the sex cells (gametes) are developed. In its narrow sense, the name is used only in connection with the lower algæ and fungi, in which the gametes are alike. In the higher plants the gametes are unlike (eggs and sperms), and the organs which produce them are called oogonia or archegonia, and antheridia.

GAMETE, gā-mēt' or gām'ēt (Gk. γαμέτην, *gametē*, wife, from γάμος, *gamos*, marriage, from γαμέειν, *gamein*, to marry). The sexual cell which fuses with another in the process of fertilization. In the lowest plants gametes are similar in appearance, and there is no apparent distinction of sex. In most plants, however, the pairing gametes are strikingly different. One of them is a small and usually ciliated body called the sperm; while the other is a comparatively large and passive body called the egg. In every case the gamete is a naked cell. The organ in which the gametes are formed is called a gametangium; and when the gametes are differentiated, the gametangium which produces the sperms is called an antheridium, while that which produces the egg is called the oogonium in the algæ and fungi (thallophytes) and archegonium in the higher groups. See FERTILIZATION.

GAM'ETOPHYTE (from Gk. γαμέτην, *gametē*, wife + φυτόν, *phyton*, plant). That phase in alternation of generations of plants which bears the sex organs. For example, in mosses the ordinary leafy moss plant is the gametophyte, while in ferns the prothallium is the gametophyte. The alternating asexual phase is called the sporophyte. See ALTERNATION OF GENERATIONS; PROTHALLIUM.

GAM'GEE, ARTHUR (1841—). An English physiologist. He was born in Florence, Italy, was educated at Edinburgh University, was there assistant in medical jurisprudence from 1863 to 1869, and in 1873 was appointed the first Brackenbury professor of physiology in Owens College, Manchester. He was also professor of physiology at the Royal Institution of Great Britain from 1882 to 1885, and became an assistant physician and lecturer on materia medica in Saint George's Hospital, London. After his retirement from Owens College as professor emeritus, he practiced medicine and conducted private investigations. He became particularly known for his researches in physiology and physiological chemistry. His writings include numerous papers on these subjects, especially the latter, a translation and edition (1875; 2d ed. 1878) of Hermann's *Grundriss der Physiologie* (Berlin, 1863), and a *Text-Book of the Physiological Chemistry of the Animal Body* (1880-93).

GAM'MER GURTON'S NEEDLE. The title of an English comedy, performed at Cambridge in 1566, and printed in 1575. It has been ascribed on insufficient grounds to John Still (1543-1607), Bishop of Bath and Wells. In order of time it is the second of the English comedies founded on Latin models, the first being *Ralph Roister Doister*, by Nicholas Udall, printed in 1566. The theme of the play is the loss of a needle by Gammer Gurton, a village housewife, while she is mending her husband's breeches, and the consequent disturbance in the household and the village. The wit is coarse, homely, and boisterous. The play contains the oldest and one of the most famous drinking songs in the English language—"Back and side go bare, go bare." For the comedy, consult Dodsley, *Old Plays*, edited by W. C. Hazlitt, vol. iii. (London, 1874-76).

GAM'MON, OILY. A smooth, swindling solicitor in Warren's *Ten Thousand a Year*.

GAM'OPET'ALÆ. Another name for the Sympetaleæ, one of the divisions of the dicotyledons (q.v.).

GAMP, Mrs. SAIREY. A professional nurse in Dickens's *Martin Chuzzlewit*, husky of voice and moist of eye, and given to stimulants during her night watching. She constantly refers to the opinions of her mythical friend Mrs. Harris in confirmation of her own views, and is noted for her plethoric umbrella, which has given the name 'gamp' to other umbrellas of similar shape.

GAMTOOS (gām'tōs) RIVER. A river of Cape Colony, South Africa, which rises in the plateau of the Great Karoo in a number of wady-like streams (Map: Cape Colony, J 9). At the eastern end of the Zwartte Berge it becomes a permanent watercourse, flowing southeasterly to the Indian Ocean, which it enters through Saint Francis Bay about 50 miles (coastwise) west of Port Elizabeth. A number of tributaries are received by the main stream from both the north and the south; the Konga River from the latter being the chief one.

GAMUNGAN, gā-mōōn'gān. A Malay people in Cagayan Province, Luzon. See PHILIPPINES.

GAM'UT. The name given to a system of musical notation invented by Guido of Arezzo, a Benedictine monk of the tenth century. He called the lowest tone of the musical system gamma (Greek letter g), and then, taking the syllables from an old Latin hymn, called the notes of the hexachord ut, re, mi, fa, sol, la. The scale thus formed, with the later addition of si for the seventh, acquired the name *gamut* (gamma-ut), or French *gamme*.

GANANCIAL SYSTEM (from Sp. *ganancia*, gain, profit). The Spanish law governing the title and disposition of property acquired by husband and wife during the existence of the marriage relation. It is almost identical with the community system of the French law and many of our Western States, the chief point of difference being that under the Spanish rule the conjugal community of ownership cannot be renounced or modified by any stipulation or agreement of the parties except in case of a judicial separation, whereas under the other system they are permitted to regulate the ownership of their separate or jointly acquired property by contract.

Several of the States acquired by the United

States from Spain have retained this system without material modification, and it exists in most of the Spanish-American countries. In Spain it is regulated by the Civil Code. The term is not generally employed in the United States. See **COMMUNITY OF PROPERTY**; **HUSBAND AND WIFE**.

GANANOQUE, gā'ná-nók'. A port of entry of Leeds County, Ontario, Can., on the left bank of the Saint Lawrence, where it issues from Lake Ontario, 18 miles east-northeast of Kingston (Map: Ontario, G 3). It is a favorite summer resort, convenient for the exploration of the Thousand Islands, which lie opposite to it. Gordon Island, just below Gananoque, has been converted into a fine public park. Gananoque has abundance of water-power, and manufactures of agricultural implements and machinery, etc. Population, in 1891, 3669; in 1901, 3526.

GAND, gān. See **GHENT**.

GANDA, **BAGANDA**, bá-gān'dā. Names applied to the Uganda Protectorate.

GANDAK, gūn-dāk', or **SALIGRAMI**, sā'lē-grā'mē. A river of the Northwestern Provinces and Behar, India, a northern tributary of the Ganges. It rises in the Nepal Himalayas and joins the Ganges opposite Patna, after a southeasterly course of about 400 miles. Only a small portion of its course is navigable below Bhelunji, but rafts of timber are floated down from Nepal. It drains an area of about 40,000 square miles.

GANDAMAK, or **GUNDAMUK**, gūn'dā-mūk'. A village in the eastern part of Afghanistan, about 60 miles east-southeast of Kabul. It figures in connection with the fatal retreat from Kabul in 1842, when a body of about 100 British soldiers and 300 camp followers were massacred here, only one man effecting his escape. In 1879 a treaty was concluded at Gandamak between the British and Yakub Khan.

GANDARA, gān'dā-rā. A town of Samar, Philippines, situated 10 miles north of Catbalogan (Map: Philippine Islands, J 8). Population, in 1898, 15,563.

GANDERCLEUGH, gān'dēr-klōōk. The imaginary residence of the imaginary editor of Scott's *Tales of My Landlord*, Jedediah Cleishbotham.

GANDÍA, gān-dē'ā. A town in the Province of Valencia, Spain, 47 miles by rail south-southeast of the city of Valencia, on the Rio Sèrpiá, or Alcoy, about two miles from the sea (Map: Spain, E 3). It is surrounded by walls, and has several buildings of merit, among which are the ducal palace, the hospital, the town hall, the Colegio de Escuela Pia, founded by Saint Francis of Borgia, who was born in Gandía, and the collegiate church, a Gothic structure with fine paintings and sculptures. There are plazas and promenades. The town is situated in an extremely fertile valley which produces grain, rice, oranges, raisins, wine, oil, silk, etc. Through the port at the mouth of the river, Gandía carries on a considerable coastwise and foreign trade; its principal industrial establishments include silk-mills, ribbon and velvet manufactories, and tanneries. Population, in 1900, 9924.

GANDO, gūn'dō, or **GANDU**, gūn'dōō. A former subordinate sultanate of the Sokoto Empire, now merged (since a treaty between France

and England in 1898) in the colonies of Nigeria and in Dahomey and the French Military Territories; reaching along both sides of the Niger from Gomba up to Birni (Map: Africa, E 3). Sokoto is on the east, the region of the Mossi on the west, and the District of Ilorin on the south. Gando is embraced among the Hausa States, being inhabited by the Hausas, Fulbes, and Surhais. The Sultanate of Gando was founded in 1802. The capital, Gando, is situated half way between Sokoto and Gomba, with a population of about 12,000.

GANDOLFO, gān-dōl'fō. See **CASTEL-GANDOLFO**.

GAND'ON, JAMES (1743-1823). An English architect, born in London, of Huguenot descent. He began the study of drawing as a boy, and was the first to receive a gold medal for architecture from the Royal Academy (1769). Two years later he went to Ireland and followed his profession there until his death, with a break of two years spent in London. Some of the most prominent buildings in Dublin were planned by him, such as the Custom House (1791), Carlisle Bridge (1791-94), and the Four Courts (1802).

GANDU, gūn'dōō. See **GANDO**.

GANELON, gā'ne-lon. One of Charlemagne's paladins, who plays an important part in the Carolingian cycle of romance. It is said that his castle was built on the Blocksberg, the loftiest peak of the Harz Mountains. Ganelon was jealous of Roland, and in order to destroy his rival, he treacherously planned with Marsillus, the Moorish King, the attack of Roncesvalles. He is represented as a man of more than ordinary build, fierce in his demeanor, and a lover of solitude. His name became a synonym of treason. He is mentioned in Chaucer's *Nun's Priest's Tale*, and in Dante's *Inferno*.

GANESA, gā-nā'shā, or **GANESH**, gā-nēsh' (Skt., lord of the host, from *gana*, host + *śa*, lord). One of the most popular Hindu minor divinities, the god of wisdom and remover of obstacles. His temples, shrines, or images are to be seen even in the smallest villages in India; and his grotesque figure, with an elephant's head, four arms, and a huge protruding belly, usually painted red, is not only familiar by the wayside, but is employed as a sign over the doors of shops, to bring luck in business. As a remover of difficulties he is invoked at the beginning of Sanskrit literary works, with the formula, *Namō Gaṇeśāya*, 'Homage to Ganesa'; and he is likewise prayed to for success in all sorts of enterprises and undertakings. In Hindu mythology, Ganesa is the son of Siva and Parvati (q.v.), or of Siva alone, and various legendary accounts are given to explain the presence of his elephantine head with its single tusk. His name, which is found also in the form *Gana-pati*, means lord or leader of the company of minor divinities that attend upon Siva. He is often represented as riding upon a rat, a creature symbolic of the god's familiarity with out-of-the-way places and dark or obscure matters. Consult: Wilson, *Hindu Mythology* (London, 1900); Dowson, *Hindu Mythology* (London, 1879).

GAN'GA (Catalan, grouse). A local name for three birds: (1) Any sand-grouse, especially the pin-tailed species (*Pterocleptes alchata*) common in Southwestern Asia, and in winter in Northern

India; (2) a South American carrion-hawk, or caracara, of the genus *Ibycter*; (3) the helmeted cockatoo (*Callocephalus galeatus*), of South-eastern Australia and Tasmania; it is prevalently gray, with a head and crest of flaming red and the feet nearly black.

GAN'GA SAGOR'. See SAUGOR.

GANGES, gān'jēz (Skt. *Gangā*, stream). An important river of Northern India, rising in Garhwal, in latitude 30° 56' 4" N., and longitude 76° 6' 40" E. It drains the southern ranges of the Himalayas, and after a southern and eastern course of 1557 miles flows into the northern section of the Bay of Bengal through a multi-channelled delta 283 miles long (Map: India, D 3). Its basin, one of the finest and most fertile portions of the world, covers an area of over 390,000 square miles, lying between the Himalaya and Vindhya ranges, and extending to the mountains which separate Burma from Bengal. The Ganges is famous as the sacred river of the Hindus. Its main source is in a snow-field imbedded between three Himalayan mountains over 22,000 feet high. It issues as the Bhagirathi from an ice cave, 13,800 feet above sea-level, and with a fall of 350 feet in a mile descends 10 miles to Gangotri, the first temple upon its banks, and a favorite pilgrim resort. Seven miles below Gangotri it is joined from the right by the Jahnvi, and at Deoprayag (q.v.), 133 miles from its source, the Bhagirathi joins the Alaknanda, the united streams being from this point called the Ganges. The Ganges leaves the Himalayas at Sukhi, and reaches the border of the great plain of Hindustan at Hardwar, 157 miles from its source and 1024 feet above the sea, after a descent of 9276 feet, or nearly 60 feet in a mile. From Hardwar it flows past Atrauli and Farukhabad, near which it receives the Ramganga, and continues past Kanauj and Cawnpore to Allahabad after a winding course of 488 miles, beset by shoals and rapids, and with an average fall of 22 inches per mile. The stream is navigable for river craft to Hardwar, for small-draught steamers to within 100 miles of the mountains, and for loaded barges to Cawnpore, 140 miles northwest of Allahabad. At Allahabad the Ganges is joined by the Jumna from the southwest, and thence the increasing river flows east to Mirzapur, Benares, Ghazipur, Patna, Monghyr, and Bhagalpur, receiving from the right the Son, and from the left the Gumti, Gogra, Gandak, and Kusi. This section, which has a fall of about five inches a mile, varies in breadth and in depth according to the season of the year, but notwithstanding many shoals, is navigable even in the dry season for vessels drawing 18 inches of water. Around the Rajmahal Hills, at the head of its delta, 563 miles from Allahabad, the Ganges bends southward and commences a descent of 283 miles to the Bay of Bengal. Near Pakaur (assuming the early name of the river) the Bhagirathi, and 70 miles lower down the Jalangi, branch off, and after individual courses of 120 miles each, unite to form the Hugli, the westernmost and principal channel of navigation, on which Calcutta (q.v.) stands. The main branch, throwing out various minor offsets, continues as the Padma, or Padda, to Goalundo, where it unites with the Jamuna, the main branch of the Brahmaputra, and finally flows through the wide estuary of the Megna into the Bay of Bengal; between this estuary and the

western channel of the Hugli lie the numerous mouths of the deltaic channels. The delta, which in the northern part is fertile and well cultivated, in the south bordering the sea is a dismal network of swampland, known as the Sundarbans (q.v.), infested by crocodiles, tigers, and other wild animals. Three distinct species of crocodiles are found in the Ganges, the fresh-water, long-snouted gavial, the man-eating koomiah, and the muggar.

The Ganges, as a whole, cannot be accurately described. From year to year it exchanges old channels for new ones, more particularly in the alluvial basin of its lower sections. Even as high as Fathipur, above Allahabad, this characteristic is marked. In this part the river bed has an average width of four miles, within the limits of which it changes its course annually, in the lapse of four or five years shifting from the one limit to the other. Between seasons the fluctuations in some places are more conspicuous; at Benares, the stream ranges, according to the time of the year, from 1400 feet to 3000 feet in breadth, and from 35 feet to 78 feet in depth. Lower down these vicissitudes produce more striking results. Toward the end of July a proportion of the delta is inundated over an area of more than 100 miles in diameter, presenting to the eye nothing but villages and trees and craft of every sort. To mitigate this evil, expensive dams have been constructed with a collective length of over 1000 miles. The influence of the tides extends, at the dry season, a distance of 240 miles from the sea. The minimum outflow of water per second has been estimated at 36,000 cubic feet, and its maximum at 494,000 cubic feet. Like all rivers subject to floods, the Ganges holds in suspension a large admixture of mud and sand, depositing in the sea annually millions of tons of solid matter.

The Ganges, or, as it is called, the Ganga (feminine), occupies an important position in Hindu mythology of the classical and the Purānic periods, and is the subject of numerous traditions and legends. In the religion of all classes of Hindus, it is held in particular veneration as the holiest of rivers, the cleanser of sins, and the entrance to Paradise, when death and sepulture occur upon its banks. Temples and shrines with ghats or flights of steps, giving easy access to its waters, stud its banks almost from its source; the most conspicuous examples are the temples and ghats of holy Benares. The junctions of the river's various affluents are especially sanctified spots; that of the Jumna at Allahabad is considered the most sacred and is the most frequented place of ablution, annually visited by thousands of pious pilgrims, who also convey the water to all parts of India for use in their religious rites.

GANGES CANAL, UPPER AND LOWER. A navigable channel of India (Map: India C 3), which obviates the difficulties in the navigation of the Ganges above Allahabad, and with numerous branches irrigates the Doab, or country lying between this river and the Jumna. The Upper Canal, commenced in 1848, and opened in 1854, extends on the right bank of the Ganges from Hardwar to Cawnpore and Etawah. The Lower Canal, commenced in 1873, continues to Allahabad. The total length of the main channel is 700 miles, and its irrigating branches

amount to nearly 3000 miles. A magnificent aqueduct of 15 arches which crosses the Solani, and the weir wall at Narora, 3800 feet long, with 42 sluices, are monumental works upon its course. The entire work cost about \$25,000,000.

GANGHOFER, gāng'hô-fēr, LUDWIG (1855—). A German novelist and playwright, the son of August Ganghofer, a celebrated forester. He was born at Kaufbeuren and studied at the universities of Würzburg, Munich, Berlin, and Leipzig. In 1879 he published his first book, a volume of poetry entitled *Vom Stamme Asra*. In 1880 his first play, *Der Herrgottschnitzer von Ammergau*, achieved success at Munich. Two other dramatic successes, *Wege des Herzens* and *Der Anfang vom Ende*, were followed by his appointment as dramatic author to the Ringtheater at Vienna, for which he wrote a number of comedies. From 1886 to 1892 he was one of the editors of the Vienna *Tageblatt*. Besides his plays and several volumes of verse he published: *Der Jäger von Fall* (1883, dramatized as *Der Zweite Schatz*); *Bergluft* (1883); *Aus Heimat und Fremde* (1884); *Die Sünden der Väter* (1886); *Edelweiskönig* (1886); *Oberland* (1887); *Der Unfried* (1888); *Der Besondere* (1890); *Die Fackeljungfrau* (1893); *Der Klosterjäger* (1894); *Die Martinsklausen* (1895); *Schloss Hubertus* (1895); *Der laufende Berg* (1897); *Das Gotteslehen* (1899); *Rachele Scarpa* (1899); *Der Dorfapostel* (1900).

GANGI, gān'jâ. A city in Sicily, 2800 feet above the sea, on the slope of a steep mountain, 65 miles southeast of Palermo, on the wagon road that leads from Termini Imerese to Leonforte (Map: Italy, J 10). Two miles distant is the Convent of San Benedetto, built on the ruins of the old town that was destroyed in 1299 by Frederick II. In ancient times Gangi was Engium, whose celebrated temple of the Matres Magnæ Cicero tells us that Verres despoiled. Population of commune, in 1881, 12,021; in 1901, 11,376.

GANGLION, gān'glî-on (Lat., from Gk. γάγλιον, tumor). In surgery, a term applied to small, tense, rounded swellings containing fluid that develop in the course of tendon-sheaths and are most often situated on the dorsum of the hand and wrist. See NERVOUS SYSTEM.

GANGOTRI, gān-gō'trê (Hind., Descent of the Ganges). A temple erected on the highest accessible spot on the Ganges (q.v.), about 10,000 feet above the level of the sea, on the right bank of the river (here called the Bhagirathi), some 10 miles from its source. Immediately in front, the stream expands into a small bay, which is subdivided into pools, taking their names respectively from Brahma, Vishnu, and other gods. Though the water is specially sacred, and ablution peculiarly efficacious, yet, from various causes, the pilgrims are by no means numerous. Besides the length and ruggedness of the journey, and the difficulty of procuring subsistence by the way, there is no accommodation for visitors, the only dwelling-house in the locality being occupied by the officiating Brahmans. However, flasks of the holy element, sealed by the attendant priests, are exported.

GANGRA, gān'grâ, COUNCIL OF. A council held at Gangra, in Paphlagonia, about A.D. 370, against Eustathius of Sebaste, who was the first

preacher of the ascetic life in the countries around Pontus, where his disciples became numerous. He taught that it is unlawful to marry and to eat certain meats; separated several married persons; and advised those who disliked the public offices of the Church to communicate at home. He wore, and imposed on his disciples, a distinctive dress, compelled women to cut off their hair, and directed his followers to shun, as profanation, the communion and benediction of a married priest. In opposition to these and similar views, the council published twenty canons condemning those who pronounced marriage unlawful, who forbade the eating of meat, refused to receive the communion at the hands of a married priest, wore a peculiar dress as a mark of unusual strictness, forsook their husbands through a false horror of marriage, and deserted their children or their parents under pretext of leading an ascetic life. Consult Hefele, *History of the Councils*; English translations by Clark, Oxenham, and Buch (Edinburgh, 1876-96).

GANGRENE, gān'grên (OF. *gangrene*, from Lat. *gangræna*, from Gk. γάγγραινα, gangraina, eating sore, from γάγρειν, grainein, to devour, Skt. gar, to swallow). The loss of vitality in a part of the living body, whether external or internal, the part becoming often, in the first instance, more or less red, hot, and painful, then livid, and finally dark and discolored, black, or olive green, according to circumstances, and later putrescent; after which a separation takes place gradually between the living and dead parts; and if the patient survive, the disorganized tissue sloughs off, and the part heals by the formation of a cicatrix. (See CICATRIZATION.) Gangrene is classified into two main varieties by the surgeon—moist and dry—according to the condition found in the part. The first variety is usually characterized by rapid, the second by slow, development. Gangrene may be brought about by local agencies, such as pressure, extreme heat or cold, chemicals, or disease or injury of the blood-vessels; or it may be due to constitutional disturbances such as accompany certain mental and nervous affections, cardiac disease, fevers, exhausting diseases, nephritis, and diabetes mellitus, or follow the administration of certain drugs, as ergot. The treatment requires that the strength of the patient be maintained by a nourishing and stimulating diet, to counteract constitutional causes, and that amputation be done or natural separation favored by the surgeon, according to his judgment. In gangrene from frostbite, or in senile gangrene, to await natural separation is the rule.

GANGS, AGRICULTURAL. A name applied to groups of women, girls, and boys brought together for labor in the fen districts of England, or the low tracts south of the Wash in the counties of Lincoln, Cambridge, Norfolk, Suffolk, and Rutland. Not long ago this part of the country was a marsh; but since dikes and canals have been constructed to drain it, it has become one of the most fertile districts of England. Instead of erecting houses on this land to be used as homes by farming tenants, the landlords escaped the exactions of the poor laws by employing laborers from the villages on the highlands near by. As women, girls, and boys worked cheaper than men, they were exclusively employed to

the number of 27,000. Near the close of the session of 1866-67 an act was passed regulating agricultural gangs. It provided that no woman or child should be employed in the same gang with men or boys, and that no woman or girl was to be employed under a male gang-master, unless a woman licensed to act as superintendent was also present with the gang. The effect of this act was most salutary. A commission was appointed in 1867 to inquire into the employment of women and children in agriculture, to investigate how far the principles of the factory acts could be applied to agriculture, with the special view of securing the better education of the children. On August 5, 1873, was passed the Agricultural Children Bill, which provided that no child should be employed under the age of eight; none between the age of eight and ten who had not a certificate showing 250 days attendance at school the previous year; and none between the ages of ten and thirteen who could not produce a certificate showing 150 days' attendance. .

GANGUE, gāng (Fr., from Ger. *Gang*, vein). The stony matrix in which metallic ores occur. Quartz is the most common gangue mineral, but calcite, barytes, fluor-spar, and other minerals are not uncommon. Portions of the gangue are sometimes worked and submitted to metallurgic processes, since they may contain enough metallic material to be classed as low-grade ore.

GANGWAY. A passageway or thoroughfare in a ship; now generally applied to the opening in the ship's rail leading to the gangway ladder, or gang-plank, and to the part of the deck in this vicinity which is forward of the quarter deck. In old-type ships the term is applied to the passages or parts of the upper deck between the quarter deck and forecastle. In the days when the quarter deck was only a partial deck, the gangway was a raised platform connecting it with the forecastle. When a ship is not lying at a wharf the gangway is reached by means of an *accommodation ladder*, which is a portable flight of steps bolted to a gangway platform (sometimes called the *upper grating*) at the upper end and reaching down nearly to the water. At the lower end it is supported by an iron span and ropes from above, or rests on a lower platform or grating. When at sea the platforms and ladder are unshipped and placed on deck; the side may then be climbed by means of iron brackets or wooden cleats secured to the side of the ship, forming a *sea ladder*.

GANGWAY (in geology). See **LEVEL**.

GAN-HWUY, gōn hwōō'ē. See **NGAN-HWEI**.

GANISTER. A hard, siliceous variety of clay, commonly associated with the coal measures. Owing to its refractory character, it is used as a lining for furnaces, particularly in iron-smelting.

GANNAL, gā'nāl', **JEAN NICOLAS** (1791-1852). A French chemist. He invented the elastic rollers used in printing, and made important improvements in the manufacture of borax and the preparation of tallow. He also discovered the method of preserving anatomical preparations, and of embalming bodies by means of solutions of aluminum salts, etc. He wrote

Histoire des embaumements et de la préparation des pièces d'anatomie normale (1841).

GANNAT, gā'nā'. The capital of an arrondissement in the Department of Allier, France, pleasantly situated on the Andelot, a tributary of the Allier, amid hills covered with vines and timber-trees, 34 miles south-southwest of Moulins (Map: France, K 5). In former times it was fortified by walls and ditches; the ruined castle is utilized as a prison. The Church of Sainte Croix presents interesting architectural features of the eleventh to the fourteenth centuries. Gannat has mineral springs, breweries, tanneries, manufactures of cutlery, and a trade in corn, wine and cattle. Population, in 1901, 5324.

GANNET (AS. *ganot*, *ganet*, OHG. *ganazzo*, MHG. *ganze*, gander; connected ultimately with Lat. *anser*, Gk. χήν, *chên*, Skt. *hainsa*, goose). A large gregarious sea-bird, closely allied to the pelicans. Gannets frequent the coasts of most parts of the world offering rocky cliffs upon which they may breed in fair security, and nine species are known, constituting the genus *Sula* and family Sulidæ. Most of the species inhabit the tropics and the Southern Hemisphere, and are called boobies (see **BOOBY**) by sailors.

The typical and best-known member of the family is the gannet of the North Atlantic (*Sula Bassana*), which derives its specific name from its frequency on Bass Rock, in the English Channel; it is also called solan (i.e. Solent) goose, for the same reason. It is scattered in summer at suitable places all around the British and Scandinavian coasts, about the islands of the North Atlantic, and from southern Greenland down to the Gulf of Saint Lawrence. Nevertheless, their colonies are scattered and steadily diminishing. This gannet has a body much like that of a goose, but weighs less; its total length is about three feet, much of which belongs to the neck, and long, strong, conical beak. Its general color when adult is white, with the head and neck buff, and the primaries of the long wings black and very conspicuous as they lie crossed above the tail when folded. Young specimens are mottled brown until three or four years old. In winter the gannets migrate to the northwest coasts and islands of Africa, or to the Gulf of Mexico; but early in the season they go north again, appearing at their breeding haunts in April, where by May they are collected in thousands about the sea-fronting cliffs. The gannets of Bass Rock were estimated in 1831 at 20,000, and in 1869 at 12,000, and are known to be decreasing there and in the Hebrides, owing to the excessive gathering of their eggs and downy young. On the American coast they nest along the shore of Labrador, and at Percé Rock and Bonaventure Island, off the Gaspé Peninsula, and on Bird Rock, an outlier of the Magdalen group, in company with murre, kittiwakes, etc.; but even in these almost inaccessible places are growing less in numbers, although somewhat protected. Upon the summits and ledges, wherever a square yard of room may be found, a gannet places its shallow nest of seaweed, and lays and incubates its single chalky-white egg. The sitting females crowded along the ledges make them look sometimes as if covered with snow, while the neighborhood will be full of

their mates, roosting, flying about, or darting down into the sea. They sail about at a considerable height, their eyes searching the surface for fish, and when one is seen they turn downward, shut the wings, and seem to drop upon it with amazing velocity, rarely missing a capture. They also make long excursions seaward, and toward the close of the breeding season are of service to the fisherman by finding and disclosing to him shoals of herrings and the like, which they follow and prey upon in great numbers. For the gannets in the Gulf of Saint Lawrence, consult the following richly illustrated books: Chapman, *Bird Studies with a Camera* (New York, 1900); Job, *Among the Waterfowl* (New York, 1902).

GANNETT, EZRA STILES (1801-71). An American Unitarian clergyman, son of Rev. Caleb Gannett, and grandson of Ezra Stiles, President of Yale College. He was born in Cambridge, Mass., and was educated at Harvard. He became assistant to Channing in the Federal Street Church, and later (1842) succeeded him as pastor. His incessant toil as the first secretary of the American Unitarian Association, one of the prime movers in the formation of the Benevolent Fraternity of Churches, founder and editor of the *Scriptural Interpreter*, and in many other interests, resulted in his breaking down in 1836, and soon after he was crippled by a paralytic stroke. But his mental activity was not abated. He edited the *Monthly Miscellany of Religion and Letters* and the *Christian Examiner*, besides attending alone to his large parish. He was an overseer of Harvard College from 1835 to 1858, and received the degree of doctor of divinity from that institution in 1843. He retired from pastoral work in 1869, and was killed in a railroad accident. He was a Unitarian of the more conservative type, an excellent preacher, and an ardent reformer. See the memoir by his son (1875).

GANNETT, HENRY (1846—). An American geographer. He was born in Bath, Maine; graduated at Harvard in 1869 and at the Hooper Mining School in the following year; was an assistant in the Harvard College Observatory in 1870-71; was topographer of the Hayden National Survey, and in 1882 became chief topographer of the United States Geological Survey. He contributed much of the geographical matter to the present edition of the *New International Encyclopædia*. His publications include: *A Manual of Topographic Methods* (1893); *Dictionary of Altitudes* (3d ed. 1899); and *Building of a Nation* (1895).

GANNETT, WILLIAM CHANNING (1840—). An American clergyman of the Unitarian Church, born in Boston, Mass. Having been ordained to the Unitarian ministry, he became pastor at Saint Paul, Minn., and subsequently at Rochester, N. Y. His publications include *A Year of Miracle and The Thought of God in Hymns and Poems* (with F. L. Hosmer).

GANO'DONTA. An order of Tertiary mammals, allied to the Edentata (q.v.), and apparently representing the ancestral forms from which they, or some of them, were derived. The oldest type (*Hemiganus*) is found in the earliest Eocene strata of North America, and is highly generalized, combining in its skeleton characters now

marking the armadillos and ground-sloths. It had a full complement of teeth and powerful jaws. The next representative is *Psittacotherium* (Upper Puerco beds), and is noticeable for its reduced dentition, and the fact that incisors (only one pair in each jaw) have enamel only upon their anterior faces. The foot is decidedly edentate. *Calamodon* is larger and shows progress toward the modern edentate type; and a still later form, *Stylinodon*, advances this progress. A review of the series shows "a gradual diminution of the incisors, a gradual loss of enamel on the teeth generally, and the production of hypselodont teeth growing from persistent pulpae; all of which are features of the later edentates" (Beddard). The order, however, includes another family, *Conoryctidae*, including the genera *Conoryctes* and *Onychodectes*, whose position with reference to the Edentata is more doubtful. Consult: Wortman, "The Ganodonts," etc., in *Bulletin of the American Museum of Natural History*, vol. ix. (New York, 1897); Beddard, *Mammalia* (London, 1902).

GANOIDEI (Neo-Lat. nom. pl., from Gk. γάνος, *ganos*, brightness + εἶδος, *eidos*, appearance), or **GANOIDEA**. One of the four orders of fishes in the classification of Agassiz. They are characterized by ganoid scales, horny plates covered with enamel, and angular (rhomboidal or polygonal) shiny scales. The small number of ganoid fish living at the present time do not form a natural group, for they have been found to be members of the three orders *Crossopterygii*, *Chondrostii*, and *Holostii*, examples of which are, respectively, the bichir (*Polypterus*), the sturgeon (*Acipenser*), and the gar-pike (*Lepidosteus*). In Paleozoic and early Mesozoic times ganoid fish were the prominent types of Teleostomes, and their remains are found in abundance in the Carboniferous, Permian, Triassic, Jurassic, and Cretaceous rocks of Europe and North America. With the close of Cretaceous time the ganoid types began to disappear and to give way to the teleost fishes, which are the predominating types at present. Thus, the ganoid structure is seen to represent an ancient, more primitive stage in the evolution of teleost fishes. Some well-known fossil ganoids are: *Holoptychius*, of the Upper Devonian; *Macropoma*, of the Chalk; *Palæonicus*, of the Permian; *Platysomus*, of the Permian; *Catopterus*, of the Triassic shales of Massachusetts, Connecticut, and New Jersey; and *Chondrosteus*, *Lepidotus*, *Eugnathus*, and *Mesturus*. See BICHIR; GAR; STURGEON; and the generic names mentioned above.

GANS, gäns, EDUARD (1798-1839). A German jurist, leader of the philosophical school of jurisprudence in Germany. He was the son of a Jewish banker, and was born in Berlin, and educated there, at Göttingen, and at Heidelberg. After his conversion to Christianity he was appointed professor at Berlin. He was a philosopher rather than a jurist, a strong Hegelian, and one of the foremost opponents of the historical method in jurisprudence, as represented by Hugo and Savigny. The philosophic theory of jurisprudence is presented by him in: *Ueber römisches Obligationrecht* (1819); *Scholien zum Gaius*; *Das Erbrecht in weltgeschichtlicher Entwicklung* (1824-35); *System des römischen Civilrechts* (1827); and in his edition of Hegel's *Grundlinien der Philosophie des Rechts* (3d ed. 1854). The Prussian Govern-

ment prohibited his lectures on contemporary history, later published as "Vorlesungen über die Geschichte der letzten fünfzig Jahre," in the *Historisches Taschenbuch* (1833-34). His other works include: *Vermischte Schriften* (1834); the personal *Rückblicke* (1836), describing his travels in England and France; and the periodicals *Beiträge zur Revision der preussischen Gesetzgebung* (1830-32) and *Jahrbücher für wissenschaftliche Kritik* (1827).

GANSEVOORT, gän'svöört, PETER (1749-1812). An American soldier, born in Albany, N. Y. On the outbreak of the Revolutionary War he joined the Patriot army, and on June 30, 1775, was appointed major of the Second New York Regiment. He subsequently accompanied Montgomery on his expedition against Canada; was promoted to be lieutenant-colonel in March, 1776; was placed in command of Fort George, on Lake George, in July; became a colonel in November; and from August 2 to August 22, 1777, defended Fort Schuyler (formerly Fort Stanwix) against Saint Leger, with a large force of British Tories and Indians, until the arrival of reinforcements under Gen. Benedict Arnold. (See FORT STANWIX.) He was a brigadier-general in the militia of New York State from March, 1781, until the close of the war, and in February, 1809, received the same rank in the Regular Army of the United States. He also filled successively the offices of commissioner of Indian affairs, commissioner for fortifying the frontiers, and military agent.

GANSFORT. See WESSEL, JOHANNES.

GANTANG (gän'tung) **PASS**. A mountain pass leading eastward from Kunawar, a district of Bashahr, in the Punjab, India, into Tibet. Its height is 18,295 feet above the sea, and it is overhung by a peak of its own name about 3000 feet loftier. The place is unspeakably desolate and rugged. Beset with perpetual snow and devoid of fuel, it is little frequented.

GANTEAUME, gän'töm', HONORÉ JOSEPH ANTOINE, Count (1755-1818). A French naval officer, born at La Ciotat. He entered the navy, in 1771, as a lieutenant, and saw service during the American Revolution. In 1794 he attained the rank of captain, in 1798-99 participated in the expedition to Egypt, and, with the rank of rear-admiral, he commanded the naval forces at the sieges of Jaffa and Acre. In 1799 he was given the title of Councilor of State. In 1804 he became vice-admiral, in 1808 commander of the Mediterranean Squadron, and in 1810 a member of the Council of the Admiralty. He supported the Bourbons, and was elevated to the peerage by Louis XVIII.

GANYMEDE (Lat., from Gk. Γανυμήδης). According to the *Iliad*, the son of Tros; or, according to others, of Laomedon, Ilus, or Erichthonius. The most beautiful of mortals, he was carried to heaven to become the cup-bearer of Zeus. The legend gradually developed, and it was the common belief that he had been borne away by the eagle of Zeus, or by Zeus himself in the form of an eagle. The eagle carrying away the boy was seemingly a favorite subject with later artists. The most celebrated was the work of Leochares, of which some conception may be obtained from a small marble copy in the Vatican. Ganyমেদে was also identified with

the divinity who presided over the sources of the Nile. The Greek astronomers likewise placed him among the stars, under the name of Aquarius (the water-bearer).

GAP, gäp. The capital of the Department of Hautes-Alpes, France, pleasantly situated on the right bank of the Luye, 84½ miles from Grenoble by rail (Map: France, N 7). It is approached through avenues of walnut trees, and is surrounded by vine-clad hills. The chief public buildings are the handsome Gothic cathedral, rebuilt since 1887; the bishop's palace; the prefecture building, containing a museum and the marble mausoleum of the Constable de Lesdiguières; a lyceum, a seminary, a library, and a theatre. The city is the seat of a bishop since the fifth century, has a court of assize, and a commercial tribunal. It has manufactures of hats, cement, leather, etc. Population, in 1901, 11,018. Gap (the ancient *Vapincum*) was formerly capital of a district of Dauphiné to which it gave the name of Gapençais. At the commencement of the seventeenth century it is said to have had about 16,000 inhabitants. Its decay dates from 1692, when it was sacked and almost wholly reduced to ashes by Victor Amadeus of Savoy.

GAPÁN, gä-pän'. The largest town of the Province of Nueva Ecija, Luzon, Philippines (Map: Luzon, E 5). It is situated in a level region four miles east of San Isidro. Population, in 1898, 20,216.

GAPER, gäp'ér. The soft clam (*Mya truncata*) of Great Britain, highly esteemed as food. The name is also occasionally applied to other similar edible bivalves. See CLAM.

GAPES, gäps (from gape, Icel. *gapa*, a yawn). A disease of poultry, due to the presence of a round gapeworm (*Syngamus trachealis*) of nearly universal distribution, found in the trachea of gallinaceous birds. Infested birds assume a characteristic drooping attitude in walking or standing, are attacked by frequent fits of coughing, and rapidly become emaciated. Many experiments seem to show that the earthworm is the intermediate host of the gapeworm, which gains entrance to the fowls when earthworms parasitized by gapeworms are eaten. On the other hand, some investigators deny any such interrelation. A favorite remedy is turpentine applied with a feather inside the windpipe. Internal doses of asafetida, garlic, or turpentine sometimes give good results. The most effective and convenient method is to make the fowls breathe the dust of air-slaked lime. This irritates the mucous membrane of the respiratory passages and produces violent coughing, during which the gapeworms, already affected by the lime, are thrown out. During the operation the fowls should be in a box or coop. Infested soil should be treated with a strong solution of common salt before the fowls are allowed to run upon it. Such treatment would probably kill the gapeworms.

GAR (from AS. *gār*, spear). The name of two different sorts of fishes having an external similarity, namely: (1) the marine garfishes, needle-fishes, etc., of the teleost family Esocidae; and (2) the fresh-water gar-pikes or billfishes of the ganoid family Lepidosteidae.

(1) The gars of the family Esocidae are round

slender fishes, sometimes five feet long, and having the jaws prolonged into a stout bill, and studded with sharp teeth; they are found in all warm seas, and are classified in four genera with about fifty species. They are voracious carnivorous fishes and powerful surface swimmers, pursuing the fleet flying fish and similar small gregarious prey, and often leaping high out of the water in their eagerness. The best-known species is the Old World garfish (*Belone vulgaris*), or greenbone, congeners of which dwell in the South Pacific and along the Asiatic coast; a prominent Oriental species is the great *Belone gigantea*, illustrated on the Colored Plate of PHILIPPINE FISHES. This genus is characterized by the presence of fin-rakers. On the tropical American coasts occur many species of the genus *Tylosurus*, popularly known as needle-fishes, spearfishes, longjaws, agujones, hound-fishes, etc. One of these (*Tylosurus marinus*) is common as far north as Cape Cod, often, like the others, ascending rivers to spawn. They are particularly numerous about the West Indies and in the Gulf of Mexico, and annoy the fishermen by tearing their nets. See AGUJA, and Plate of NEEDLE-FISH.

(2) The fresh-water gars, billfishes, bony pikes, or pikes, form a family of ganoid fishes (Lepidosteidae), the only living representatives of the order Rhomboganoidea, which was rich in forms in earlier geological times. (See GANOIDEI.) They have an elongated nearly cylindrical body, covered with a bony case of rhomboidal scales. The head, whose external bones are very hard and rugose, terminates in a long beak-like snout, with nostrils near the end of the upper jaw; and the jaws are set with several series of sharp recurved teeth. The dorsal fin is set well back, above the anal fin. There is a single genus, *Lepidosteus*, comprising five species, inhabiting the lakes and rivers of North America and China, some of which are very numerous in individuals. The most familiar species is the common billfish or gar-pike of the United States (*Lepidosteus osseus*), which under favorable conditions becomes five feet long, and is numerous found in lakes and rivers from Vermont to Texas. It lives by preying upon other fishes, and is not itself good for food. It is nocturnal in its activities, and in early summer seeks shallow places in which to lay its eggs, which are glutinous and adhere to the first object they come in contact with. When the fry hatches from the egg it has a row of suckers above a very large mouth with which it clings to submerged stones. The short-nosed gar (*Lepidosteus platostomus*) is smaller and has a shorter bill; it has a northerly range. The great or alligator gar, or manjuari (*Lepidosteus tristæchus*), belongs to the Southern States, Cuba, and Mexico, and sometimes reaches sixteen feet in length. A fourth species inhabits the west-coast streams of Central America, and a fifth is found in China. Compare BICHIR.

GARAMANTES, gâr'â-mân'têz. An ancient people of Garama (Jerma), northwest of Murzuk, in the oasis of Fezzan (Phazania), Tripoli, North Africa. This was the southern limit of the Roman Conquest. At the end of the seventh century the Arab Mohammedans swept away the vestiges of the Roman power. With perhaps a strain of negro blood, there are mixed in the veins of the present inhabitants that of Hamite,

Mediterranean, and Semite. They are akin closely with the native population of Ghadames, in common with whom they were conquered by the Quæstor Cornelius Balbus in the reign of Augustus.

GARANCINE (Fr. *garance*, Lat. *garantia*, madder). A red dye-stuff which may be derived from madder, and which was formerly much used on an industrial scale. It was originally obtained by Robiquet and Colin in 1827, who treated the ground madder with an equal weight of concentrated sulphuric acid. This treatment caused the formation of alizarin (q.v.), which was the coloring principle of garancine, and of which the latter contained a higher percentage than madder. Garancine therefore dyed more readily than madder, yielding brilliant reds and pinks with yellow tone, and lilacs with a gray shade.

GARASHANIN, gâr'â-shâ'nên, ILIYA (1812-74). A Servian statesman, born at Garachi. He studied at the Normal School of Semlin, entered the civil service, and in 1844 became Minister of the Interior. From 1852 to 1854 he was president of the Council, and in 1857-58 again Minister of the Interior. In 1862 he was once more at the head of the Cabinet, conducting the department of Foreign Affairs until 1867. As Minister of the Interior he inaugurated many reforms, particularly in connection with the system of public education and the administration of justice.

GARAT, gâr'â', DOMINIQUE JOSEPH (1749-1833). A French statesman and man of letters. He was born at Bayonne, and as a youth came to Paris, where he soon became known as a writer of *éloges* and editor of the *Journal de Paris*. After 1786 he enjoyed immense vogue as a lecturer on history at the Lycée. Going over to the partisans of the Revolution, he became a slavish adulator of Danton, whom he succeeded as Minister of Justice in 1792, becoming Minister of the Interior the following year. He was imprisoned during the Reign of Terror, but was freed after the fall of Robespierre, and became Minister of Public Instruction. He was Ambassador to Naples in 1798, and member of the Ancients in 1799. Made a Senator and a count by Napoleon, he remained faithful to him after the first Restoration, and was consequently ousted by Louis XVIII. from the Institute of France, to which he had been elected in 1795. After 1830 he became a member of the Academy of Morals and Political Science. Garat's character, like his brilliant literary style, was inherently weak, resting on no steadfast principles. Hungry for success and applause, he fawned upon Bourbon and Sans-culotte, Napoleon and Louis Philippe with equal assiduity.

GARAT, JEAN PIERRE (1762-1823). A French singer and composer, born at Ustariz. He began to study law and went to Paris to finish his course; but his great talent for music was almost immediately recognized, and he was patronized by the Count d'Artois, who introduced him to Marie Antoinette. He gave her lessons in singing and became a Court favorite. During the Revolution he went to Germany with Rode, the violinist, where his success was astonishing. He returned to France in 1794, and sang in the concerts at the Théâtre Feydeau (1795). He then went abroad again and sang throughout the

Continent with equal success. About 1796 he was made professor at the Conservatory, and was a popular teacher. He is said to have been the most wonderful singer France ever produced. His voice ranged from tenor to barytone, and suited all styles of music. He was also a composer; but his songs, it is said, owed most of their charm to his manner of singing them. Among these songs are: "Je t'aime tant;" "Bélisaire;" and "Le ménestrel exilé."

GARAY, gör'oi. János (1812-53). An Hungarian poet, born at Szegszárd. He was an ardent patriot, and all his poems deal with national subjects, although they are formed on German models. He held a chair in the University of Pesth for a year (1848), and was librarian there from 1850 until his death. His works include: *Csatár* (1834), an epic, which made him widely known, and the tragedies *Arbocz* (1837), *Ország Ilona* (1837), and *Bátori Erzsébet* (1840). His lyric poems are of a high order. There is an excellent edition of his complete works by Ferenczy (1888), who also wrote his *Life* (Buda-pest, 1883).

GARAY, gá-rí', JUAN DE (1541-84). A Spanish soldier, born in Biscay. He went to Paraguay about 1565, was appointed secretary to the Governor, made a voyage up the Paraná River, and in 1573 founded the city of Santa Fé de Vera Cruz. Subsequently he was appointed a lieutenant-general, and in 1580 he founded on the site of the first settlement the present city of Buenos Ayres. While returning to Asunción, he was massacred by hostile natives. In his dealings with the Indians he was humane and beneficent. His doings are celebrated by Bareo Centenera in the poem *La Argentina* (Lisbon, 1602).

GARB, or **GARBE** (OF. *garbe*, *jarbe*, Fr. *gerbe*, from OHG. *garba*, Ger. *Garbe*, sheaf; ultimately connected with Lith. *grapti*, Skt. *grabh*, to grasp). In heraldry, a sheaf of any kind of grain. If it is blazoned garb simply, wheat is understood; if any other kind of grain is intended, the kind must be mentioned, as a 'garb of oats.' See HERALDRY.

GARBAGE AND REFUSE DISPOSAL (ME. *garbage*, entrails of fowls; probably from OF. *garbage*, tribute paid in sheaves, from *garbe*, sheaf). A term used in the United States to designate kitchen wastes of animal and vegetable origin, incident to the preparation and serving of food. Associated with it there is likely to be more or less inorganic matter, some of which, such as tin cans and bottles, have been in contact with food materials. It is not uncommon to place all household wastes, other than sewage, in the garbage can or box, including ashes. In England all the wastes named are classed under the general head of refuse, and are placed in a common receptacle, or dust-bin. Aside from household wastes there are various classes of trade and manufacturing refuse, such as paper, rags, and shavings; also green stuff from vegetable markets, and the odds and ends from butcher shops, such as bones, scraps of meat, grease, and offal.

Much of the organic matter named, when fresh, is similar to, and generally quite as inoffensive as, the food supplies from which it was rejected, but its unstable character renders it liable to offensive decomposition. Hence it must be re-

moved promptly from dwellings and other buildings, and so transformed or otherwise disposed of as to give rise to no offense. The most primitive means of disposal are dumping on land or in water. A slight improvement on these processes is the burning of a portion of the wastes in the open air, but this rarely affects more than certain light combustibles, like paper and shavings, that have been mixed with the garbage proper. As the population of a city and its suburbs increases land disposal becomes intolerable except by burial, and finally impracticable by that means. The dumping of garbage and refuse at sea is expensive at best, besides being likely to cause the fouling of beaches and harbors.

By keeping organic and inorganic wastes in separate receptacles their final disposal is greatly simplified, but the difficulties incident to their storage and prompt removal from the premises of householders is thereby increased. Ashes, as they come from stoves and furnaces, are composed of inert inorganic matter, with no harmful or objectionable qualities save those due to dust and dirt. In America, town ashes seem to be of little use for any purpose except filling, for which they are most excellent. Paper, like many other classes of light, dry household and industrial wastes, is not necessarily offensive, but its unsightliness and possible association with organic wastes make its speedy and complete disposal highly desirable. Occasionally wastes of this nature are made to yield a revenue sufficient to pay a part of the cost of their collection and disposal.

Considering the vast quantities of material and large number of cities and towns concerned, the problem of the final scientific disposal of the city wastes is still in its infancy. Their collection, however, is on a far better basis, although leaving much to be desired. There do not appear to be more than three hundred cities and towns, in all the countries of the world, that have adopted thoroughly modern sanitary methods of garbage and refuse disposal; and many of the cities falling within this class have made but a beginning as yet. Great Britain and the United States seem to be far in the lead in matters of final disposal. Outside of some of the larger American cities, nearly all the improved processes of disposal employ cremation, or burning, in specially designed furnaces. In Europe the practice is to make the refuse consume itself, without extra fuel. In America large quantities of extra fuel are almost always required, for reasons explained below. In Great Britain many of the destructors, as they are called, are fitted with boilers, which generate steam for use about the plant, or for electric lighting, a number of combined refuse destructors and electric-light plants having been built recently. Besides utilizing the heat, the clinkers from the English furnaces are often put to a variety of uses, being ground up and mixed with cement, for making slabs or tiles for sidewalks, or being used for the foundations of pavements. In the United States nearly all the attempts to recover anything from garbage treatment have aimed to extract grease from the garbage, and to make the tankage, left after separating the grease and water, into a fertilizer base.

Great Britain took the lead in the installation

of garbage furnaces, both in point of time and in superior results attained. From 1870 to 1876 several crude furnaces were tried. In the latter year the city of Manchester put in operation the prototype of the more recent and more successful furnaces, thus antedating by many years the first furnace built for a city in the United States, which was erected at Des Moines, Iowa, in 1887. The common use of soft coal in open fireplaces in England leaves a larger percentage of combustible matter in the ashes from dwellings in that country than in the domestic ashes of American cities, while the people of the United States produce far larger quantities of watery green vegetable wastes, particularly in summer, than is the case abroad. Both of these facts favored the more rapid development of garbage furnaces, or refuse destructors, in England than in America, besides which the need for improved means of disposal was felt sooner in the former country. The tendency in America has been and still is to exclude ashes, and, to a less extent, old or broken crockery and the like, from garbage. This was partly due to the American practice of feeding garbage or swill to hogs, and, in the earlier days, even to cows. Farmers from the surrounding country would gather the swill for their stock, but would refuse that containing foreign matter. These food wastes were, and are yet, sometimes gathered by the municipality, or by a general contractor, and delivered to farmers at the outskirts of the city. Originally householders may have received a small sum for their swill, but latterly they have been fortunate if they can get it taken away without expense. At present, collections by or for American farmers are generally restricted to small towns, or to the hotels and restaurants of the larger places. The feeding of city garbage to either cows or hogs, particularly to milch cows, should be prohibited by State and city legislation. Household wastes in the country, when so fed, are generally fresh and harmless, but in the city they are liable to be in such a state of decomposition as to affect injuriously the milk of cows and the flesh of animals used for food. It may be added that wherever there is any attempt to recover paper, rags, glass, and the like from city wastes those substances should not be mixed with either garbage or ashes, since the sorting made necessary where mixing is allowed is a disgusting if not dangerous task for those engaged in it. The sorting is all the more objectionable because most of the work is done by women and children.

Before describing garbage furnaces and reduction plants a few words regarding the collection of city wastes may be said. Garbage proper should be collected in carts or boxes provided with water-tight, non-absorbent boxes or tanks, with closely fitting covers. Steel is now considered to be the best material for such tanks. Ashes and other dry wastes should be gathered in tight carts, well covered to prevent scattering by jolting or wind. The best material for the ash-wagon boxes, or tanks, is also steel, but this matters comparatively little from a sanitary standpoint, so long as the conditions named are fulfilled. The frequency of collection should vary with the character of the wastes and the population. Market wastes, the garbage of hotels and restaurants, and of houses in crowded districts, often require daily collection, particularly in the sum-

mer. Domestic garbage, under ordinary conditions, requires collection from two to three times a week in warm, and once or twice a week in cool or cold weather. Ashes, paper, and all other inorganic wastes, so long as not mixed with garbage, may be collected to suit the convenience of the householders and the municipality, the tendency being to increase the frequency with the density of population and consequent lack of room for storage. Cleansing or disinfection of garbage cans and wagon boxes or tanks is practiced in the most progressive communities. Whether garbage and refuse collection and disposal should be performed by contract or directly by the municipality is a question for each community to settle for itself. Many sanitarians favor direct municipal performance, as giving better sanitary results. An efficient city government can secure good work under either plan, but perhaps complaints of poor service may receive more prompt attention when the work is done by the municipality. In many American cities the collection, and in still more the final disposal, of garbage and refuse is left entirely to private scavengers, under little or no municipal control. The results are that the people having most need of good service get none whatever, being unwilling or unable to pay for it, while the work as a whole is generally poorly done. The final disposal, under this plan, is almost always a makeshift. Whatever may be done as to ashes and inorganic wastes, good sanitation demands that the collection and disposal of garbage, offal, and dead animals should be attended to by the municipality, either under the contract or day-labor system. As a matter of economy it is probable that all the wastes considered in this article should be handled by or under the direction of the city or town.

Garbage Furnaces, or Refuse Destructors, as they are called in Great Britain, consist of one or more grates upon which the garbage is burned, ash-pits, flues, and chimneys, together with the necessary feeding holes for the garbage, and stoking holes or doors. In America supplementary fuel is almost invariably used, generally on a separate grate. In England, as already explained, special fuel is rarely employed; a boiler for steam-raising is generally used, and it is becoming more and more common to use either steam jets or blowing fans to produce a forced draught. Most of the American furnaces have level grates, the heat from the extra fuel passing horizontally over one and sometimes two garbage grates. The English furnaces generally have one level grate, with an inclined surface leading to it from the feeding hole above, so designed that the refuse is dried and heated before it reaches the main fire. The English furnaces are usually composed of small units, or cells, of uniform size, each having a grate surface of 25 square feet. Any desired capacity is secured by increasing the number of cells, which are commonly placed back to back, with a central flue. In America the cells are larger, and the various manufacturers have not adopted a standard size. A few years ago it was the accepted practice in Great Britain to have a small special fire, generally of coke, in the base of the stack. This was designed to produce a high temperature for the complete combustion of all the gases from the main fires, before they passed

up the chimney and into the atmosphere. These *fume cremators* are being discontinued in England, with the introduction of forced draught and higher temperatures. They were never so generally used in America, but are still employed here and there in forms more or less modified from the English practice. Some form of *dust-arrester* is often used in the later English furnaces to hold back the fine ashes which might otherwise pass up through the chimney and cause a nuisance in the surrounding territory. These are chambers or passages designed to bring the dust to rest and to retain it for future removal. Probably such devices are more essential in England than in America, owing to the large quantities of ashes put through the furnaces and the use of forced draught in the former country. The *temperature* of a garbage furnace should be in the vicinity of 2000° F., in order to insure complete combustion and to prevent odors from the chimney gases. *Boilers* for utilizing heat from garbage furnaces should not be placed directly over the fire, since the water in the boiler will lower the temperature in the furnaces. To avoid this, the boilers are placed between the furnaces and the chimney, or between two furnaces. This causes a loss of heat for steaming, but sanitary considerations should come first. In the later English plants water-tube boilers are being installed.

In America practically nothing has been accomplished in the way of utilizing heat from garbage furnaces. Early in 1900 a single garbage furnace was installed at one of the municipal electric-lighting stations in Chicago, and arrangements were made for a similar installation at Grand Rapids, Mich. The combined refuse destructor and electric-lighting plant at Shoreditch, England (a part of the city of London), has attracted much attention. The destructor was opened on June 28, 1897. There are twelve furnaces, or cells, each having a grate area of 25 square feet; six water-tube boilers, with 1300 square feet of heating surface; and a thermal storage tank 8 feet in diameter and 35 feet long, designed to store water heated by the steam at times of small demand for electric lighting. The thermal storage tank does not seem to have been tried at any other garbage furnace. A forced draught, rated at 8000 cubic feet per minute, is supplied by three fans, driven by electric motors. The chimney is 150 feet high, with a dust-arrester at its base. Each furnace has a capacity of 8 to 12 tons of refuse in 24 hours, or 96 to 144 tons in all. The aggregate horse-power of the connected boilers is about 1200. During the first two years of its operation, the Shoreditch plant consumed about 25,000 short tons of refuse a year. The value of English refuse for steam-raising purposes appears to run from 5 to 15 per cent. that of coal, assuming a coal that will evaporate 10 pounds of water from and at 212° F. per one pound of coal. This is omitting extremes. Probably 10 per cent. is the maximum safe figure upon which to base estimates for continuous work, and even that may be too high.

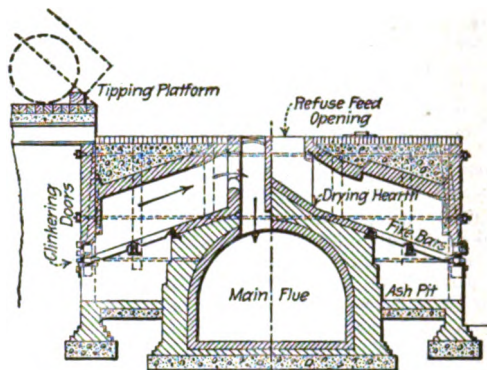
The following particulars relating to some other European refuse destructors have been taken from Goodrich, *The Economic Disposal of Town's Refuse* (London and New York, 1901). Birmingham has over fifty cells in use, burning

about six long tons per cell per day. In 1897 the total amount of refuse burned was 96,309 long tons, out of a total of 200,703 long tons collected. Leeds also has about fifty cells, with an average capacity of about seven long tons each. Liverpool has some forty-four cells with a capacity of about seven long tons per cell per day. Manchester, although the first city in the world to put in permanent garbage furnaces (in 1876), still sends some 70,000 long tons of refuse to the dumps each year, but has ordered 18 new cells. At Hunstanton 3½ long tons of refuse per day is burned, the heat from which furnishes steam sufficient to drive the pumps supplying the town with water. Berlin and Hamburg, Germany, are the chief examples of Continental cities with garbage furnaces. Over twenty furnaces are said to be in use in Berlin, having an estimated capacity of some 1300 long tons a day. Coal is used as a secondary fuel, and it seems that relatively little steam is utilized. Mr. Goodrich appears to have attempted to secure a complete list of all the cities in the world having garbage furnaces, together with at least a brief description of each. His summary, with figures for the United States and Canada, as collected by the *Engineering News*, is as follows: England, including 18 districts in the metropolitan district of London, 123 cities; Scotland, 6; Ireland, 2; Channel Islands, 1; Continental Europe, 4; South Africa, 2; India, 3; South America, 3; Australia, 4; the East, 3; Canada, 2; United States, 50; total, 203. Outside of Great Britain, Canada, and the United States, quite a number of cities may have been overlooked, and possibly 10 to 15 additional cities in the United States should be included. It should be noted, too, that the garbage of 16 of the largest cities of the United States is treated by the reduction process, as stated in more detail below.

American garbage furnaces, as may be seen from what has preceded, have not been so fully developed as English, such superiority as can be claimed for American sanitary engineers in this respect being for the reduction rather than the cremation of refuse. Just how large a part of the difference between the two countries is due to variations in the character of their respective wastes it is hard to say, since there does not seem to be any thoroughly satisfactory data on this point. In general, it may be noted that some English writers give the average percentage composition of ash-bin refuse as follows: Breeze (or partially burned coal) and cinder, 50; coal and coke, 1; ash, 12; dust and dirt, 20; paper, straw, fibrous material, and vegetable refuse, 13; bones and offal, 0.6; rags, 0.4; bottles, tins, metals, crockery, broken glass, 3; total, 100. After the refuse passes an English furnace there remains 20 to 40 per cent. of the original weight in the form of ashes and cinders. It is believed that American garbage, even when mixed with ashes, contains more organic matter than is shown by the figures just given, and that its percentage of moisture is far higher. The latter must be evaporated before the combustible matter can be burned. To add still further to the difficulty of burning American wastes, the ashes, when mixed with the other refuse, appear to contain less combustible matter than those in England, owing partly to the large quantities of soft coal burned, and that imperfectly, in England. An-

other drawback to the development of American garbage furnaces is the practice of awarding short-term contracts for disposal, or changing the methods in vogue with each change of city administration. Under all these circumstances it is not strange that American garbage furnaces have not been brought to a higher state of perfection, nor that it is hardly known what they might accomplish in long service under favorable conditions. Some of the most successful furnaces in America follow English practice very closely. Of a list of 50 cities with garbage crematories in the United States, all but 15 had populations of 25,000 or more by the census of 1900. The largest city and most capacious plant in the list is San Francisco, Cal., where a private company owns 32 furnaces, or cells, with a rated daily capacity of 600 tons per day. The company has a franchise under which it has thus far succeeded in compelling the private scavengers who collect garbage, ashes, and other refuse in San Francisco to bring their collections to the furnaces and pay the company 20 cents a load for burning it, the loads not to exceed one cubic yard each. The weight of the refuse is estimated at 800 pounds per cubic yard. On this basis, over 61,000 short tons, or 215 tons a day, were burned in 1899. At both Milwaukee, Wis., and Minneapolis, Minn., large furnaces were under construction early in 1901. A small portion of the garbage of Greater New York is burned in a number of furnaces scattered over outlying districts. The one small furnace in Chicago has already been mentioned. Boston has the distinction of being the only city in the United States with a well-equipped refuse-sorting plant. Light refuse from a part of the city is brought to this station, dumped, shoveled onto an inclined conveyor, from which men and boys sort out various grades of paper, rags, and all other merchantable refuse as the particular kinds pass the person to whom the task of removing it is assigned. The residue is dumped automatically into a furnace and readily burned, producing

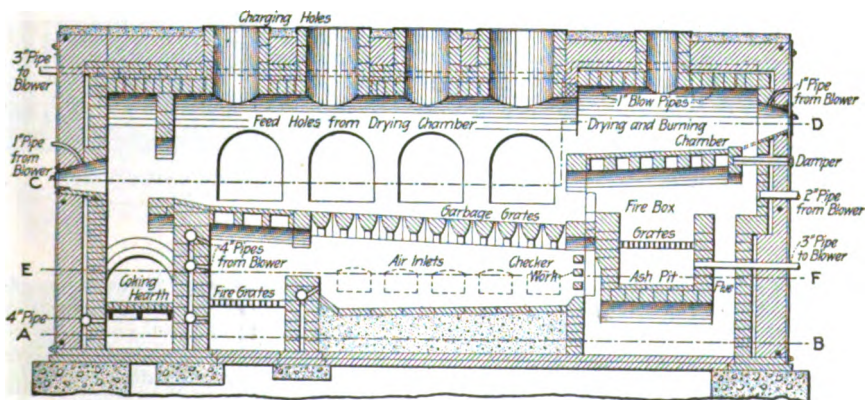
put in use, including the Warner, Horsfall, and Meldrum. The first American garbage furnace, opened at Des Moines, Iowa, about September, 1887, was designed by Andrew Engle. In December of the same year a Rider furnace was



SECTION OF FRYER REFUSE DESTRUCTOR.

fired up at Pittsburg, Pa. At present, the Engle, Dixon, Smith-Siemens, and Thackeray furnaces lead in North America, most of the plants being supplied with either Engle or Dixon apparatus. The Thackeray furnaces at Montreal and San Francisco have inclined drying grates, but larger than those employed in the English furnaces.

Garbage reduction aims to recover grease and fertilizing material from animal and vegetable household and market wastes, while at the same time affording a sanitary means of final disposal. The process requires, for its greatest success, a rigid exclusion of all other wastes from those named, both to reduce the bulk of inert and unprofitable refuse and to prevent damage to the plant. The first step is the extraction of grease. This is effected by melting with steam heat, combined with pressure, or by means of such solvents as naphtha and benzine. Sulphuric acid has been



Longitudinal Section X-Y.

GARBAGE CREMATORY AT MILWAUKEE, WIS., LONGITUDINAL SECTION.

more than enough steam to run the plant. The paper and like salable material is baled ready for shipment.

The first permanent English furnaces, built at Manchester, England, were designed by Alfred Fryer. Since then many other styles have been

tried and found unsatisfactory. In most of the plants, and for the greater part of the garbage now being treated, steam is used. Where a solvent is employed, naphtha is more often chosen than benzine, but the general process is much the same in either case.

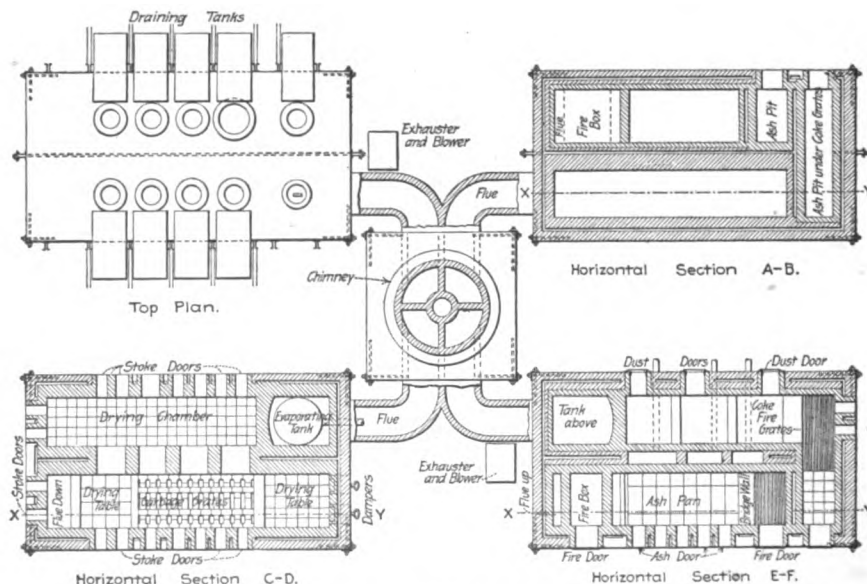
In the steam plants the grease is extracted in rendering tanks, after which the residue, or tankage, is pressed and then dried to free it from moisture. Where naphtha is employed, the drying generally takes place before the solvent is applied. The rendering tanks, or digesters, are cylindrical, some 5 feet in diameter and 15 feet high, with tightly fitting covers for the charging holes and a horizontal valve at the foot of the conical bottom, to empty the charge. Pipe connections are provided for admitting steam or chemicals, as the case may be, and pipes or other channels for leading away the various liquids after the garbage has been treated for a sufficient length of time, generally a number of hours. The tankage is sometimes pressed by steam in the rendering tank and sometimes in presses of either the cheese-cake or roller type. The driers are generally steam-jacketed horizontal cylinders, fitted with revolving stirring arms, mounted on a longitudinal axis. Grinding-mills are sometimes provided for such of the tailings from the screens as are of value, chiefly bones. The dried and screened tankage is generally sold to fertilizer manufacturers, but at a few plants phosphates and other rich fertilizers are mixed with it, so as to produce a finished or commercial fertilizer. The grease and water are separated by gravity, in tanks, the grease rising to the top and being skimmed off. In some cases the grease is refined at the reduction works, but usually there is little attempt to do much refining. It may be shipped to buyers in tank cars or in barrels. Where naphtha is used it is recovered by distillation. The water from the digesters is sometimes discharged directly into a sewer, stream, or lake. In other cases it is evaporated to 'stick,' and mixed with the dried tankage, increasing the value of the latter, and at the same time not polluting any body of water. In the best plants

plants require an extensive equipment of boilers, engines, pumps, tanks, driers, and other apparatus, the capital charges on which, together with the expenses for fuel and other supplies, and for labor, make up a large total. On the other hand, there is a considerable revenue from the sale of grease and tankage. All the reduction plants in the United States are owned and operated by private companies, which do not wish to reveal the details of their business to their rivals or to the municipalities with whom they have or from whom they hope to secure contracts. It is, therefore, impossible to give reliable figures as to the cost of constructing and operating reduction plants, or the amount and value of the grease and fertilizer recovered and sold. Obviously, these figures vary widely with the character and amount of garbage handled and with local conditions governing the cost of construction, of fuel, and of labor. Information collected under the direction of the late Col. George E. Waring, Jr., in 1895, showed that 3000 tons of summer garbage, from different cities and treated by various methods, gave the following average composition:

	Per cent.	Pounds per ton
Rubbish.....	7	140
Water.....	71	1,420
Grease.....	2	40
Tankage.....	20	400
	100	2,000

The selling value of the products from a ton of such garbage was given as follows:

Grease, 40 lbs. at 3 cts.....	\$1.20
Tankage { Ammonia, 13 lbs. at 8 cts.....	1.04
Phosphoric acid, 13 lbs. at 1 ct.....	13
Potash, 3 lbs. at 3½ cts.....	10
Total.....	\$2.47



PLAN AND SECTIONS OF GARBAGE CREMATORY AT MILWAUKEE, WIS.

all objectionable vapors are condensed and the gases are purified by scrubbing, or else conveyed to and burned in the boiler furnaces. Reduction

Based on the total weight of tankage, the value of the 400 pounds would be about one-third cent per pound. Winter garbage would contain a

larger percentage of grease and less moisture. The price of both grease and tankage is liable to wide fluctuations.

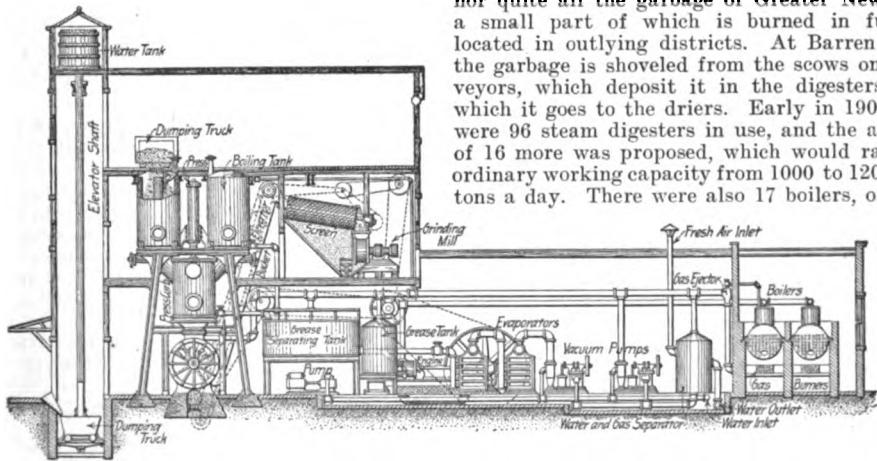
The sixteen cities in the United States where contractors were treating garbage by reduction early in 1901, with their respective populations by the census of 1900, and the method of grease extraction employed, are as follows:

CITY	Pop'n	Method
Boston.....	560,892	Steam
New Bedford.....	64,442	"
Buffalo.....	352,387	Naphtha
New York.....	3,437,202	Steam
Syracuse.....	108,374	"
Utica.....	56,383	"
Allegheny.....	129,896	Naphtha
Philadelphia.....	1,293,697	Steam
Pittsburg.....	321,616	Naphtha
Washington.....	278,718	Steam
Cincinnati.....	325,902	Benzine
Cleveland.....	381,768	Steam
Columbus, Ohio.....	125,660	"
Indianapolis.....	169,164	"
Detroit.....	245,704	"
Saint Louis.....	575,238	Naphtha
Total.....	8,466,943	

It will be noted that all these cities have populations of over 50,000. The list includes 10 of the 19 cities in the United States having populations of 200,000 or more. Of the other nine cities in that class, San Francisco, Milwaukee, Louisville, and Minneapolis have furnaces; Chicago has one small one, insignificant in comparison with its total garbage output. Baltimore, New Orleans, Newark, and Jersey City

treatment at Detroit and for cremation at Milwaukee.

Prominent because of the size of the cities employing it, and the completeness of the plants in many of their details, is the Arnold system, in use at New York, Philadelphia, and Boston. The New York plant has a contract capacity of 1000 short tons a day, and is said to have been crowded to a rate of 1500 tons. The only garbage-disposal plant approaching it in size is the crematory at Berlin, Germany, with a reported capacity of 1300 long, or about 1450 short, tons. The New York works are located on Barren Island, about 25 miles, by water, from the Battery, or the extreme lower end of old New York. There are really two plants here, one built for New York and one for Brooklyn, before consolidation, but the contractors operate them together. The contractors receive the garbage on scows at the various docks, tow it to the works, and treat it, for \$89,990 a year, under the New York contract, and for an average of \$121,000 a year, under the Brooklyn contract; but the latter includes collection from houses and other buildings, as well as towage and final disposal. For the year 1899 there were treated under the New York contract 151,600 short tons, giving a rate of about 60 cents per ton for transportation and treatment. Under the Brooklyn contract, a total of 104,000 tons was collected, shipped, and treated, at an average cost to the city of \$1.20 per ton. It must be understood that these quantities do not include ashes, street sweepings, and light refuse, most of which are dumped at sea, nor quite all the garbage of Greater New York, a small part of which is burned in furnaces located in outlying districts. At Barren Island the garbage is shoveled from the scows onto conveyors, which deposit it in the digesters, from which it goes to the driers. Early in 1900 there were 96 steam digesters in use, and the addition of 16 more was proposed, which would raise the ordinary working capacity from 1000 to 1200 short tons a day. There were also 17 boilers, of about



SECTIONAL SKETCH OF GARBAGE REDUCTION WORKS AT SYRACUSE, N. Y.

have no improved means of garbage disposal, but something is proposed at Baltimore, and there was once a reduction plant at New Orleans.

The first reduction plant in the United States was put in use at Buffalo, N. Y., in or about the year 1888, under United States patents granted in 1886 to Joseph Merz, of Bruen, Moravia. The Merz system has been modified since by Charles W. Preston and F. G. Wiselogel. Merz patents were taken out abroad as early as 1882. The patents covered the extraction of grease by use of the lighter hydrocarbons. Naphtha is used in the Merz process. At one time the system was in use at Buffalo, Detroit, Milwaukee, and Saint Louis, but it has been abandoned for steam

250 horse-power each, and various engines, pumps, and accessories. An immense fan, some 20 feet in diameter, and with a face of 6 feet, was used to exhaust steam and gases from the digester and press-house, and send it to a large scrubber. The gases from the various inclosed tanks and other vessels are passed through jet condensers.

A small but compact and apparently well-designed plant, built under what is known as the Holthaus system, is in use at Syracuse, N. Y. There are four digesters, in which the garbage is treated with steam under a pressure of about 60 pounds per square inch; a cylindrical press, working under a pressure of 2000 pounds

per square inch; a steam drier, a conveyor, elevator, and screen for the dried tankage; a grease and water separator; and an evaporator for the water, besides means for treating the gases and vapors; boilers with a combined capacity of 180 horse-power, a 100 horse-power engine, an electric-lighting plant, and a fertilizer factory. The daily capacity of the plant is stated as 50 tons. One of its noteworthy features is the arrangement of the digesters over the press and the press over the drier, with proper connections, so the garbage is not exposed to the air from the time it goes into the digesters until it comes out as dried tankage.

For additional information, consult: Goodrich, *The Economic Disposal of Town's Refuse* (New York, 1901); Maxwell, *The Removal and Disposal of Town Refuse* (London, 1898); Waring, *Street Cleaning and the Disposal of a City's Wastes* (New York, 1897). The latter, however, contains but little on garbage furnaces or reduction plants. Goodrich's book has a chapter devoted to American practice. Many descriptions of individual American plants have been given in the *Engineering News* and *Engineering Record* (both of New York) during the past ten or twelve years.

GARBE, gār'be, RICHARD KARL (1857—). A German Orientalist, born at Bredow, Pomerania. He studied at Tübingen, became a lecturer in 1878, and in 1880 professor, at Königsberg. In 1885-87 the Prussian Government defrayed his expenses for travel and residence in India, and the study there of the native philosophy. *Indische Reiseskizzen* (1880) chronicles some of his impressions at that time. His further publications include an edition (1878) and translation (1878) of the *Vaitāna Sūtra*; *The Crauta Sūtra of Apastamba* (1882-85); *The Sāmkhya Sūtra Vritti* (1888; an English translation was published in 1892); and *Die Sāmkhya-Philosophie* (1894).

GARBO, gār'bó, RAFFAELINO DEL. See RAFFAELINO DEL GARBO.

GARBORG, gār'börg, ARNE (1851—). A Norwegian novelist and publicist, born on the island of Time, in the District of Jæderen. In 1877 he founded the *Fædraheimen*, a journal in the popular idiom, and his novels are written in the same language. Among these, nearly all translated into Danish or Swedish, are the following: *A Free Thinker* (1881); *The Students from the Country* (1883); *Stories and Traditions* (1884); *Men* (1886). He also wrote *The New Norwegian Language and the National Movement* (1887) and *Free Discussion* (1889).

GARÇÃO, gār-soun', PEDRO ANTONIO CORREA (1724-72). A Portuguese poet, born in Lisbon. He was one of the members of the celebrated 'Arcadia' of Lisbon, and was the author of some beautiful verse. His "Cantata a Dido" is especially fine. He is called 'the Portuguese Horace.' His *Obras poeticas* have gone through several editions; the latest (1888) contains an excellent biography.

GARCIA, gār-sē'a, DIOGO (1471-1529). A Portuguese navigator, born at Lisbon. Under commission of a mercantile firm at La Coruña, he sailed with three ships for South America in 1526, arrived at São Vicente, Brazil, on January 11, 1527, and explored the Uruguay and

Paraná rivers. He aided the expedition of Sebastian Cabot, which was besieged by natives on the lower Paraná, and in 1528 returned to Spain without having discovered any precious metals. It is said that he afterwards made a voyage to the East Indies, and that the island of Garcia, in the Indian Ocean, is named from him.

GARCIA, gār-thē'a, MANUEL DEL PÓPOLO VICENTE (1775-1832). A famous Spanish tenor singer and teacher of singing, born at Seville. At six years of age he was a chorister in the cathedral there. His teachers were Ripa and Almarcha, whose thorough training, combined with his own great talent, brought him distinction when but seventeen in the triple rôles of singer, composer, and conductor. After winning an established reputation as a singer in Cadiz and Madrid, he went to Paris (1808), and achieved instantaneous success at the Italian opera. In 1811 he proceeded to Italy, meeting with great popular manifestations of public favor. The next five years were spent in study, and on his return to Paris, in 1816, disagreement with Catalani, the manageress of the Théâtre Italien, ended in his going to London (1817), where he was enthusiastically received. Either alone or with a company he visited England, South America, the United States, and Mexico, meeting everywhere with unqualified success. His compositions are now forgotten, although they were successful in their day, and included forty-three operas, written either in Spanish, French, or Italian. His fame as a teacher is enduring, his theories, proven by successful results, forming the groundwork of the best modern teaching. Among his successful pupils were his daughters, Maria Felicitas Malibran and Pauline Viardot Garcia, and the singers Nourrit, Rimbault, and Favelli. He died in Paris.

GARCIA-GUTIERREZ, gār-thē'a-gōō-tyā'-rath, ANTONIO (1812-84). A Spanish dramatist, born at Chiclana. As a youth he studied medicine at Cadiz, but his bent was always toward literature, and in 1836 he produced his play *El trovador*. It was a brilliant success. Verdi afterwards took this drama as a subject for his opera *Il trovatore*. None of Garcia-Gutierrez's other works was well received, although several of them were finer, especially *Juan Lorenzo* (1865). His poetry was published under the title *Luz y tinieblas* (2 vols, 1842, 1861). This volume also includes some pretty comedies. His plays were published by himself, as *Obras escogidas* (1866).

GARCIA HIDALGO, gār-thē'a ē-dāl'gō, JOSÉ (c.1656-c.1712). A Spanish painter, born at Murcia. He studied in that town under Villacis and Gilarte, and then went to Italy, where he received instruction from Pietro da Cortona, Salvator Rosa, and Carlo Maratta. He was made painter to the King in 1703. The works of Garcia belong to the period of decadence. With Carrino he painted some frescoes in the cloister of San Felipe el Real.

GARCIA MORENO, gār-sē'a mó-rā'nó, GABRIEL (1821-75). A politician of Ecuador, born at Guayaquil. He was educated at the University of Quito and in Europe, and became successively professor of chemistry and rector at Quito. In 1859 he was chosen head of the Provisional Government, and in 1861 President. After an administration marked by cruelty and many con-

cessions to the ecclesiastical power, he proclaimed himself Dictator in 1865. In 1869, and again in 1875, he was reelected President, but previous to his inauguration in the latter year was assassinated.

GARCÍAS, gár-thé'ás, PEDRO. A wealthy licentiate, spoken of by Le Sage in the preface to *Gil Blas*. Two journeying scholars came upon a fountain bearing the inscription, "Here is buried the soul of the licentiate Pedro Garcías." On removing a stone they found a leather purse containing 100 ducats.

GARCIA Y INIGUEZ, gár-sé'a é é-ne'gés, CALIXTO (1836-98). A Cuban patriot and soldier, born at Holguin, Santiago Province. He began the practice of law; but in 1868 became associated with Donaté del Mármol as a leader in the Ten Years' War, and soon attained the rank of brigadier-general. Subsequently, upon the removal of Gen. Máximo Gomez by the Provisional Government, he was appointed commander-in-chief of the Cuban forces. At San Antonio del Bahar, with a band of 20, he was surrounded by 500 Spaniards, and to avoid capture shot himself through the breast, but, having recovered, was deported to Spain and there imprisoned. In 1880 he fought with José Maceo in the six months' rebellion known as the 'Little War,' again was captured, and for fifteen years was held in Spain under police surveillance. Upon the outbreak of the final insurrection against Spain, he escaped in 1895 to Paris, and thence went to the United States, where he was active as a filibuster. An expedition fitted out under his direction, and embarked on the *J. W. Hawkins*, failed through the wreck of the vessel, and \$200,000 worth of arms and ammunition was lost. Afterwards he succeeded in reaching Cuba on the *Bermuda*, with six field guns and other supplies. During the insurrection, as commander of the troops in Camaguey and the Oriente, he won several brilliant victories, and in the Spanish-American War led a Cuban force of 4000 at El Caney (July 1, 1898). He died while in Washington as the head of a commission sent by the Assembly of the Provisional Government to discuss Cuban affairs with President McKinley.

GARCILASO DE LA VEGA, gár-thé-lá'sò dà lá vá'gá (1503-36). A Spanish soldier and poet. He was born at Toledo, and early adopted the profession of arms. He gained a distinguished reputation for bravery in the wars carried on by the Emperor Charles V. against the French and Turks, but was mortally wounded while storming a castle near Fréjus, in the south of France, and died at Nice. Garcilaso, though prematurely cut off, lived long enough to win immortality by the part which he played, in conjunction with his friend Boscan, in revolutionizing the national poetic taste of his countrymen. Like Boscan, he imitated the Italian poetical manner, and substituted Italian verse forms for the older national measures, which he used in only very few cases. His eclogues, it should be said, show also a Vergilian influence. His pieces consist of only thirty-seven sonnets, five canzones, two elegies, one epistle, and three pastorals. Singular to say, they do not contain a trace of military ardor, but are inspired by a tender sweetness and melancholy which appear to have deeply affected his countrymen. Garcila-

so's poems were first published in 1543, in an edition of Boscan's works. They are most accessible in the collection of Spanish masterpieces called the *Biblioteca de autores españoles*, vols. xxxii. and xlii. (cf. Wiffen's English translation, published in 1823). For the best account of his life, consult Navarrete, in Salvá y Baranda, *Documentos inéditos para la historia de España*, vol. xvi. (1850).

GARCILASO DE LA VEGA (c.1540-1616). A Peruvian historian, known as 'the Inca.' He was the son of one of the Spanish Conquistadores, and grew up amid the civil turmoil of the early years of Spanish rule in Peru. He became familiar with the men and events of the time, so that his history has all the flavor of actuality. At his home he met relatives of his mother, an Inca princess, who told him much of the history of his family and of the land over which they had ruled. After his father's death, Garcilaso decided to go to Spain. He entered the army as a captain, and served against the Moriscos. Becoming involved in debt, he retired from the military service and entered on a literary career. He translated Abarbanel's *Dialogues of Love* from the Italian, published in 1590, and then turned his attention to history. From an old soldier, a companion of De Soto, he learned the story of the conquest of Florida, which he wrote out in a bombastic literary style. Meanwhile he had gathered from his early schoolmates their recollections of early days in Peru, and by combining these with his own memories, especially of what he had heard from his mother's people, he prepared the *Royal Commentaries of Peru*, a work of prime importance, filled with interesting detail and in the main authoritative. The first part was published in 1609, and the second in 1617, a year after the author's death, which took place at Cordova, where he had passed the latter half of his life. The *Commentaries* have been translated, with notes and an introduction by Markham, and published by the Hakluyt Society (London, 1869).

GARCIN DE TASSY, gár'sân' de tá'sé', JOSEPH HÉLIODORE SAGESSE VERTU (1794-1878). A noted French Orientalist. He was born in Marseilles, studied Oriental languages as a pupil of the distinguished Silvestre de Sacy, and in 1828 was appointed to the chair of Hindustani especially founded for him at the Ecole des Langues Orientales. In 1838 he was elected to succeed Talleyrand in the Académie des Inscriptions et Belles-Lettres. Subsequently he became president of the Société Asiatique and an administrator of the Ecole. Originally known as a student of Mohammedanism and a translator from the Arabic, he was later recognized as the foremost European savant in the undeveloped and difficult field of the Hindustani language and literature. His annual review, *La langue et la littérature hindoustanies* (1872-77), was authoritative, not only throughout Europe, but as well among native Indian scholars. His publications include: *Les oiseaux et les fleurs* (1821), Arabic text, with translation; *Les aventures de Kamrup*, Hindustani text (1835); *Les œuvres de Wali*, with text, translation, and notes (1863); *La poésie philosophique et religieuse chez les Persans* (1864); and his chief work, a *Histoire de la langue et de la littérature hindoues et hindoustanies* (2d ed., 3 vols., 1871). He also

prepared a French edition (1849) of Sir William Jones's *Grammar of the Persian Language* (1771).

GARCIN'IA. See MANGOSTEEN.

GARD, gâr. A department of France, in Languedoc, bounded on the east by the river Rhône, its southern extremity reaching into the Mediterranean, in a headland which has a coast line of about 10 miles (Map: France, L 7). Area, 2253 square miles. Population, in 1890, 416,036; in 1901, 420,836. A considerable part of the surface is occupied by forests, plantations, and vineyards. On the coast there are extensive and unhealthful marshes. It is watered mainly by the Rhône and its tributaries—the Gard, the ancient Vardo (from which the department has its name), and the Cèze. The northwest is occupied by a branch of the Cévennes Mountains; the remainder slopes toward the Rhône and the Mediterranean. The soil is in general dry, the best lands occurring in the river valleys. Coal, iron, lead, and zinc are found in several places, and salt is manufactured in the south. The vine, the olive, and the mulberry are extensively cultivated. The silk industry is important. Lignite is worked in the northeast of the department. Wine is largely exported. The department is divided into the four arrondissements of Nîmes, Alais, Uzès, and Le Vigan. Capital, Nîmes.

GARDA, gâr'dâ (Lat. *Lacus Benacus*). The largest lake in Italy. It is 34 miles long, from 3 to 11 miles broad, 189 square miles in area, and its greatest depth is 1135 feet (Map: Italy, E 2). Its northern extremity is in Tyrol, and Peschiera, at its southern extremity, is 16 miles west of Verona and 77 miles east of Milan. There is communication by steamboat once or twice daily between different points on the lake. The principal fish are salmon trout, trout, pike, and eels. The water is often rough, especially when there is a storm from the north. (Consult Vergil, *Georgics*, II., 160.) The southern shores are low and flat; but as the lake narrows toward the north the spurs of the Alps rise boldly from the water's edge. The chief tributary is the Sarca, and the only outlet is the Mincio, which descends from Peschiera to Mantua, and discharges into the Po.

The most fashionable resort is Gardone-Riviera; but dearest to the poet and to the antiquarian is Sirmione, a narrow promontory that extends 2½ miles out into the lake. The view from it is magnificent, and there are the ruins of Roman baths and of a building said to be the villa of the poet Catullus. Salò, a small town with terraces of lemon groves, has a church containing several interesting paintings; Maderno has a basilica of the eighth century. Malcesine is the place where Goethe was arrested by the Venetian officials. To the beautiful little village of Garda the lake owes its name. Riva, at the north end of the lake, in Austrian territory, is popular with tourists, on account of its hotels, ruins, and climate in summer. It is the starting-point for numerous excursions over the mountains.

GARDAIA, gâr-dî'â, or **GHARDAYA** (locally, *Faghardeit*). An important trading point of the Sahara, and the chief town of the Mزاب District in Algeria, situated on a hill in the oasis of Gardaia, amid rocky mountains, 312

miles in a direct line south-southeast of Algiers (Map: Africa, E 1). It is fortified by a wall surmounted with towers and pierced by gates; possesses several mosques, one remarkable for its size, and has a flourishing caravan trade with Tunis, Algiers, Fez, Morocco, Sudan, and Timbuktù, in slaves, barley, dates, pottery, provisions, oil, wool, cotton, indigo, leather, gold dust, ivory, and all the varied raw products of Central and Northern Africa. Its trade is for the most part in the hands of Jews, who inhabit a separate quarter. The population consists chiefly of the Beni Mزاب, who speak a Berber dialect modified by Arabic. Gardaia is surrounded by extensive date-palm orchards, and is irrigated by artesian wells. In the vicinity are the ruins of a Roman tower. The Mزاب Confederation, formerly independent, has acknowledged the sovereignty of France since 1850. In 1857 Gardaia, its capital, was surrendered to the French and was made a military station. Population, in 1892, 38,967.

GARD'ANT, Fr. pron. gâr'dân' (Fr., gazing, pres. p. of *garder*, to look). In heraldry (q.v.), a term used of an animal which is represented full-faced.

GARDEN, ALEXANDER (c.1730-91). An American physician and naturalist. He was born in Charleston, S. C.; was educated in Scotland, was professor in King's College (now Columbia University) in 1754, and in 1755 settled as a physician in Charleston. At the time of the Revolutionary War he sided with Great Britain, and in 1783 emigrated to London, where he lived until his death. He wrote a number of papers on zoölogical and botanical subjects. The genus *Gardenia* was named in his honor.

GARDEN, ALEXANDER (1757-1829). An American soldier and writer, born in Charleston, S. C., and educated at Glasgow, Scotland. On the outbreak of the Revolutionary War he joined the Patriot party, and from March, 1781, to the close of the war was volunteer aide-de-camp to General Greene. He is known chiefly as the author of *Anecdotes of the Revolutionary War, with Sketches of the Character of Persons Most Distinguished in the Southern States for Civil and Military Services* (1822; last ed., 3 vols., 1868).

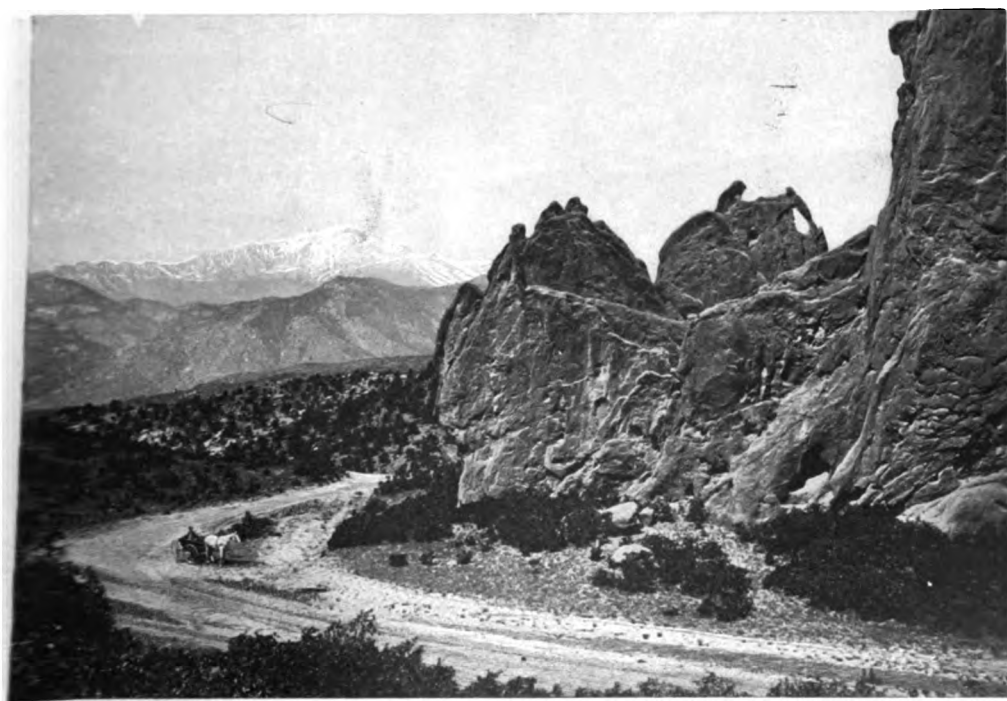
GARDE NATIONALE, gürd ná'syó'nál'. See NATIONAL GUARD.

GARDEN CITY. A village in Nassau County, N. Y., about 20 miles from New York, on the Long Island Railroad. It was projected by A. T. Stewart as a model suburban village, and is the seat of the Protestant Episcopal Bishop of Long Island, with the cathedral schools of Saint Paul's and Saint Mary's. The Cathedral of the Incarnation is a fine specimen of Gothic architecture, erected by Mrs. Stewart in honor of her husband. It has a magnificent organ, one of the largest in the world, that cost \$100,000.

GARDEN CITY. A popular name for Chicago, from its numerous parks and gardens.

GARDENER-BIRD. See BOWER-BIRD.

GARDE'NIA (Neo-Lat., from Alexander Garden). A genus of trees and shrubs of the order Rubiaceæ, natives of tropical and subtropical countries, many of which are now favorites in greenhouses and hothouses, on account of their



"THE GARDEN OF THE GODS"
CATHEDRAL SPIRES (UPPER)
THE SEAL AND BEAR (LOWER)

beautiful and fragrant flowers. Some of them are hardy enough to endure the open air in summer. The corolla is funnel-shaped, or approaching to salver-shaped, the tube much longer than the calyx; the fruit, a berry, crowned with the calyx. The name Cape jasmine is given to *Gardenia jasminoides*, popularly known as *Gardenia Florida*; a Japanese species is well known in America. The fruit, which is about the size of a pigeon's egg and orange-colored, is sold in the shops of China and Japan for dyeing silks yellow. A beautiful yellow resin exudes from wounds in the bark of *Gardenia gummifera*, an East Indian species. The wood of *Gardenia Thunbergii* and *Gardenia Rothmannia* is very hard, and is used for agricultural implements, wheel-axes, etc., at the Cape of Good Hope. Both of these species are grown in American hot-houses. See JASMINE.

GARDENING. See HORTICULTURE.

GARDEN OF ENGLAND. Worcestershire: so named because of its fertility.

GARDEN OF EUROPE. A frequent designation for Italy, from its fertility, climate, and scenery.

GARDEN OF FRANCE. A name sometimes used of the ancient Province of Touraine.

GARDEN OF ITALY. A popular designation of Sicily, because of its fertility and scenery.

GARDEN OF THE GODS. The name given to a region in Colorado, near Colorado Springs, covering about 500 acres, and remarkable for the strange forms of the rocks with which it is covered. The red and white sandstone here assumes grotesque shapes to which various names have been given. The Gateway is formed by two huge masses of rock, of a bright red color, and 330 feet high, between which the road passes.

GARDEN OF THE HESPERIDES. See HESPERIDES.

GARDEN SNAIL. The British name of the large, brightly colored land-snail (*Helix aspersa*), common and sometimes troublesome in gardens throughout Europe. It is edible when well cooked, but not so often eaten as another species (*Helix pomatia*), known and cultivated as the 'edible' snail. Some interesting folklore attaches to this species in the rural districts of England and Scotland. See SNAIL, and Colored Plate of NORTH AMERICAN SNAILS.

GARDENS OF CÆSAR. See CÆSAR, GARDENS OF.

GARDENS OF LUCULLUS. See LUCULLUS, GARDENS OF.

GARDENS OF MÆCENAS. See MÆCENAS, GARDENS OF.

GARDENS OF SALLUST'. See SALLUST, GARDENS OF.

GARDEN VEGETABLES. See VEGETABLES.

GARDEN WARBLER. An English name of a small brownish warbler (*Sylvia hortensis*) of Southern Europe, called in England 'greater pettychaps,' familiar about gardens, and noted for its sweet and varied song, whence the Germans call it 'false nightingale.' It is often caged, under the French name *fauvette*, but does not endure captivity well. This is the bird known to the Italians as *beccafico* (q.v.), because it

punctures the ripening figs, as illustrated in the article FIG.

GARDE SUISSE, gärd swés. See SWISS GUARD.

GARDIE, gärdé', MAGNUS GABRIEL DE LA (1622-86). A Swedish statesman, born in Reval. He studied at the University of Upsala, became Ambassador to France, and subsequently commanded the Swedish Army in Livonia. During the minority of Charles XI. he was Lord Chancellor, but later fell into disfavor and was deprived of his estates. He presented to the University of Upsala the famous Codex Argenteus. (See ULFILAS.) His very extensive collection of manuscripts was acquired in 1848 by the library of the University of Lund.

GARDINER, gärd'nér. A city in Kennebec County, Maine, six miles south of Augusta; on the Kennebec River, and on the Maine Central Railroad (Map: Maine, D 7). Naturally endowed with excellent water-power, it has saw, paper, and pulp mills, foundries and machine-shops, a shoe-factory, and manufactures of lumber in various products. Lumber and ice are largely exported. There is a public library with about 6000 volumes. Settled in 1760, Gardiner was part of Pittston until 1803, when it was incorporated as a town. It was chartered as a city in 1849. The government is administered under the charter as revised in 1895, by a mayor elected each year, though custom extends the term to two years, and a bicameral council. Population, in 1890, 5491; in 1900, 5501. Consult Hanson, *History of Gardiner, Pittston, and West Gardiner* (Gardiner, 1882).

GARDINER, FREDERIC (1822-89). An American Episcopalian scholar. He was born at Gardiner, Maine, September 11, 1822; graduated at Bowdoin College, 1842; entered the Protestant Episcopal ministry; was professor in the Berkeley Divinity School at Middletown, Conn., from 1868 to his death, July 17, 1889. He was one of the best Bible students of his day, and his publications include commentaries upon Leviticus, II. Samuel, Ezekiel, and Jude; a harmony of the Gospels in Greek and in English (1871); *The Principles of Textual Criticism* (1876); *The Old and New Testaments in Their Mutual Relation* (1885); *Aids to Scripture Study* (1890).

GARDINER, JAMES (1688-1745). A daring Scottish soldier, famous for his remarkable religious experience. He was born at Carriden, Linlithgowshire, Scotland, in 1688. When only fourteen he obtained a commission in a Scotch regiment in the Dutch service. In 1702 he entered the English Army, and fought with distinction in the campaigns of Marlborough. He was promoted to the rank of major in 1718. Up to this time his life had been extremely dissolute. But in 1719, while bent upon pleasure, he happened to take up a religious book, and while reading it saw what he considered a vision of Jesus Christ. He was immediately 'converted' and thenceforth lived a pious and excellent Christian life. He became colonel in 1743, and two years later was mortally wounded in the battle of Prestonpans. Consult: Doddridge, *Some Remarkable Passages in the Life of Col. J. Gardiner* (London, 1747; many later editions); Carlyle, *Autobiography*, edited by Burton (Edinburgh, 1860).

GARDINER, JOHN (1731-93). An American lawyer, the son of Dr. Sylvester Gardiner. He was born in Boston, studied law, and practiced his profession for a time in London and in Wales. A friend of John Wilkes, he appeared as junior counsel of the latter in 1764. While serving in the Massachusetts Legislature, he procured the abolition of the law of primogeniture in Massachusetts, and the prohibition of special pleading, and strove earnestly for the repeal of the anti-theatrical laws. He was one of the leaders of the original Unitarian movement in Boston.

GARDINER, LION (1599-1663). An English settler in America. He was a military engineer, and had seen service in the English Army in the Netherlands. In 1635 he arrived at Boston under contract to remain for a term of four years in the service of a company which had obtained the patent of a tract of land situated at the mouth of the Connecticut River. He designed and built a fort which he called Saybrook, and remained in command there until 1639. In that year he bought from the Indians the island called by him the Isle of Wight, now known as Gardiner's Island, where he made the first English settlement within the present limits of the State of New York. To his little domain of nine miles in length by a mile and a half in width he gained proprietary rights which enabled him to rule independent of external authority as lord of the manor.

GARDINER, SAMUEL RAWSON (1829-1902). An English historian. He was born at Ropley, Hants, March 4, 1829, and was educated at Winchester, and at Christ Church, Oxford. He subsequently studied at Edinburgh and at Göttingen, taking the degrees of J.U.D. and Ph.D. In 1884 he was elected fellow of All Souls, and in 1892 fellow of Merton. Until 1885 he was professor of modern history at King's College, London, and was examiner in history at Oxford University, 1886-89. On the death of Froude he was offered, but declined, the regius professorship of modern history at Oxford. On August 16, 1882, he was granted a Civil List pension of £150. Gardiner's first important work was his *History of England from the Accession of James I. to the Disgrace of Chief Justice Coke, 1603-1616* (2 vols., 1863). Subsequent installments appeared at various intervals until 1881, when they were reissued in a revised collective edition, the earlier volumes much altered, under the title *History of England from the Accession of James I. to the Outbreak of the Great Civil War, 1603-1642* (10 vols., 1883-84). The *History of the Great Civil War* appeared in 3 vols. (1886-91), and was reissued in a slightly revised form for the collective edition in 4 vols. (1893). The third and last installment of the great combined work, under the title *History of the Commonwealth and Protectorate*, of which three volumes, including the year 1656, appeared in 1894-1901, was arrested by Mr. Gardiner's death. He was the first English writer to treat this controversial period in detail from a non-partisan standpoint. His work rests upon the most laborious and exhaustive study of all the sources of the period which has been attempted. In this his efforts were lightened for the earlier part of the work by the various *Calendars of State Papers* still in process of publication. He was also greatly favored by numerous discoveries

of new material, among which the most important are that of the great collection known as the Clarke MSS. in the library of Worcester College, Oxford, the Verney MSS., the 'Paston Letters' of the seventeenth century, the 'Nicholas Papers,' the 'Hamilton Papers,' and the secret correspondence of the Papal agent Rossetti in England with Cardinal Barberini. In the history of the Long Parliament Mr. Gardiner explains adequately for the first time the rise of the Cavalier party, and the division, growing into the Civil War, which arose from differences of opinion in matters of religion. Besides his great work, Mr. Gardiner edited numerous volumes for the Camden Society, and contributed many articles and reviews to the *English Historical Review*, of which he was editor from 1891 to 1901. He summarized the results of his labors in the following recent works: *Cromwell's Place in History* (1897); *Oliver Cromwell*, a biography first published in an elaborately illustrated volume (1899) and afterwards in a cheaper form without the illustrations (1901). Other works are: *Constitutional Documents of the Puritan Revolution* (1889; 2d ed. 1899); *What the Gunpowder Plot Was* (1897); *The Thirty Years' War, 1618-1648* (1874); *The First Two Stuarts, and the Puritan Revolution, 1603-1660* (1876). Of his works for the use of students, the following deserve special mention: *A Student's History of England* (3 vols., 1890-92); *A School Atlas of English History* (1891); with Mullinger, *Introduction to the Study of English History* (1881; 3d ed. 1894). He died at Seven Oaks, Kent, February 23, 1902.

GARDINER, STEPHEN. An English prelate and statesman, born about 1483. He was the reputed son of John Gardiner, a cloth-worker, at Bury Saint Edmunds, and studied at Trinity Hall, Cambridge, where he distinguished himself in classics. In 1520 he became doctor of civil law, next year of canon law, and in both branches speedily attained eminence. In 1524 he was appointed Rede Lecturer in the University, and the same year became tutor to a son of the Duke of Norfolk. That nobleman introduced him to Cardinal Wolsey, who made him his secretary. In this capacity he gained the confidence of Henry VIII., and, owing to his legal qualifications, was sent to Rome in 1528, to conduct the negotiations with the Pope for the King's divorce from Catharine of Aragon. His arguments were unavailing, but on his return he was made Secretary of State. In 1531 he was appointed Archdeacon of Leicester, and the same year was installed Bishop of Winchester, vacant by Wolsey's death. A determined opponent of the Reformation and a staunch Catholic, he nevertheless wrote *De Vera Obedientia* (1535) in support of the King's supremacy. Various embassies to France and Germany were now intrusted to him, and after the execution of Thomas Cromwell, Earl of Essex, whose downfall was due mainly to him, he acquired great power. The tale of his impeachment of Catharine Parr and subsequent disgrace by Henry VIII. is doubtful, but on the accession of Edward VI. he was imprisoned for his opposition to the Reformation, and deprived of his bishopric. When Mary came to the throne in 1553 she restored him to his see, and made him Lord Chancellor and Prime Minister. He officiated at the Queen's coronation, and at her nuptials with Philip of Spain. How far he was responsible for

the persecution of Protestants during her reign is a debated question. He was a man of great erudition, and a friend of learning in every form. His writings consist of a number of tracts on theological and literary subjects, and include his interesting letters to Sir John Cheke against the Anglicizing of Greek pronunciation. Although a worldly-minded ecclesiast, he was a devoted and zealous worker, and conspicuous for religious consistency. He died in 1555. Consult: Cooper, *Athenæ Cantabrigienses*, vol. ii. (Cambridge, 1858), for his writings; Gairdner, *Letters and Papers . . . of the Reign of Henry VIII.* (15 vols., London, 1862-96); Brewer, *Reign of Henry VIII.* (2 vols., London, 1884); Maitland, *Essays on the Reformation in England* (London, 1849); Dixon, *History of the Church of England* (4 vols., London, 1878-91); Burnet, *History of His Own Time* (6 vols., Oxford, 1833); Lingard, *History of England* (13 vols., London, 1837); Froude, *History of England* (12 vols., New York, 1870).

GARDINER, SYLVESTER (1707-86). An American physician. He was born in South Kingston, R. I., studied medicine in Paris and London, and began practice in Boston. He was instrumental in colonizing that part of the 'Plymouth Purchase' lying along the Kennebec River, and in settling the town of Pittston, Maine, from which the present city of Gardiner, named in his honor, was subsequently set off. He established a church and library there, and was one of the founders of King's Chapel, in Boston. On the outbreak of the Revolutionary War he joined the Loyalist element in Boston, and in 1776 removed to Halifax, N. S., whence he subsequently removed to England, his name having meanwhile been included in the proscription and banishment act of 1778. In 1785 he returned to this country, and settled at Newport, where he died.

GARDINER'S ISLAND. A portion of Suffolk County, N. Y., lying five miles off Long Island on the south side of the east entrance of Long Island Sound, in the bay formed by the two arms of Long Island (Map: New York, H 4). It has an area of 3300 acres. It has been the property of the Gardiner family ever since the white settlement of the country. It was on this island that the noted pirate (or privateer) Captain Kidd secreted much of his treasure, which was afterwards discovered and appropriated. There is a lighthouse on the north side of the island.

GARDNER. A town in Worcester County, Mass. (Map: Massachusetts, D 2), including the villages of Gardner Centre, South Gardner, and West Gardner, 25 miles north of Worcester: on the Fitchburg branch of the Boston and Maine Railroad. It has the Levi Heywood Memorial Library, an almshouse, and a home for the aged, and Dunn and Crystal Lake parks. It is the seat of an extensive chair-manufacturing industry that employs 3000 persons. The government is administered by town meetings, convened whenever necessary. Gardner was incorporated as a town in 1785, its population then being about 375. Population, in 1890, 8424; in 1900, 10,813.

GARDNER, ELIZABETH JANE (1842—). An American artist, born at Exeter, N. H. She studied in Paris under Merle, Lefebvre, and Bouguereau, and her pictures have been exhibited constantly in this country and abroad. Among

her works are: "Cinderella;" "Cornelia and Her Jewels" (1872); "Corinne" (1874); "Fortune Teller" (1876); "Maud Muller" (1879); "Daphne and Chloë" (1882); and some portraits.

GARDNER, ERNEST ARTHUR (1862—). An eminent English archaeologist, born in London. He was educated at the City of London School, and at Gonville and Caius College, Cambridge, of which he was fellow 1885-94. Since 1884 he has devoted himself to archaeological work, and was director of the British School of Archaeology at Athens (1887-95). At present he is Yates professor of archaeology in University College, London. He conducted the excavations at Naukratis in Egypt (1885-86), and has carried on similar explorations in Cyprus, at Megalopolis, and on many other sites in Greece. His numerous publications include a *Handbook of Greek Sculpture* (1896-97); *Catalogue of Vases in the Fitzwilliam Museum* (1897). He has been a frequent contributor to archaeological journals, and since 1897 has been co-editor of the *Journal of Hellenic Studies*.

GARDNER, GEORGE (1812-49). A Scotch botanist, born in Glasgow. He studied at the University of Glasgow, qualified as a surgeon, turned his attention from medicine to botany, and, assisted by subscriptions obtained in great part through the influence of his instructor, Sir W. J. Hooker, explored Brazil from May, 1836, to the close of 1840. During his absence he forwarded to England 60,000 specimens divided among 3000 different species. His total number of specimens represented more than 6000 different species. In 1842 he was elected a member of the Linnæan Society of London, in 1844 was appointed superintendent of the botanical garden of Ceylon, and in 1845 visited India for botanizing purposes, and became an associate editor of the *Calcutta Journal of Natural History*. He aided H. B. Fielding in the writing of *Sertum Plantarum* (1844), and published *Travels in the Interior of Brazil* (1846), and many papers in the *London Journal of Botany* and other periodicals.

GARDNER, HENRY BRAYTON (1863—). An American political economist and educator, born in Providence, R. I. He graduated in 1884 at Brown University, studied at the Johns Hopkins University, and was subsequently appointed professor of political economy at Brown. In 1897-98 he was vice-president of the American Economic Association. His publications include *Statistics of Municipal Finance* (1889; in new series, No. 2, of the American Statistics Association's publications), and a second monograph under the same title in new series, No. 2 (1899), of the publications of the American Economic Association.

GARDNER, PERCY (1846—). An English classical archaeologist, born at Hackney. He received his education at the City of London School and at Christ's College, Cambridge, of which he was made a fellow in 1872; since 1887 he has been professor of classical archaeology in Oxford University. Professor Gardner is best known for his numerous publications dealing with ancient numismatics. Among his other works are: *New Chapters in Greek History* (1892); *Sculptured Tombs of Hellas* (1896), etc. He is corresponding member of archaeological institutes in many foreign countries.

GARDNER GUN. A machine gun consisting of two simple breech-loading rifle-barrels, placed parallel, about 1.4 inches apart, in a case or compartment. The barrels are loaded, fired, and relieved of shells by one revolution of the hand crank. These guns, of .45-inch calibre, are used in the United States service. See MACHINE GUN.

GARDONE-RIVIERA, găr-dô'nă rê-vê-ă'ră. A winter resort on the western shore of Lake Garda (q.v.), in Northern Italy. It is sheltered by the mountains from all raw winds, and, in winter, has little rain, much sunshine, and an even temperature. About 1884 it became popular with Russians and Germans, and is now visited by invalids and tourists from all parts of the world. Population of commune, in 1901, 1987.

GAREFOWL, or **GAIRFOWL** (Icel. *geirfugl*, Swed. *garfögel*, Dan. *geirfugl*; Eng. *gerfalcon*; connected with OHG. *gir*, Ger. *Geier*, vulture, OHG. *ger*, *giri*, greedy + *fugl*, AS. *fugol*, Ger. *Vogel*, fowl). The great auk (*Plautus impennis*) once frequently seen in the Hebrides, but now extinct. It was the largest of its race, standing about 29 inches high, and resembling a big razor-bill. It was black above and white beneath in winter, the head changing to snuff-brown in summer. Its small wings were useless for flying, and it waddled about with great difficulty on land. Its defenselessness and stupidity made it easy to kill, even with clubs, and at first it was slaughtered and its rookeries robbed of eggs for food or amusement. Later the demand for its feathers caused its rapid destruction, and the last bird was killed about 1844. See AUK.

GARETH, SIR. The youngest son of King Lot and Morgaine in the Arthurian legends. He entered the Court of his uncle, King Arthur, concealing his identity at the request of his mother, and received from Sir Kay the nickname Beaumains. At the expiration of a year, he received knighthood and, at the request of Linet, liberated her sister Liones, who was imprisoned in Castle Perilous, and whom he afterwards wedded. Tennyson's "Gareth and Lynette" has some variations.

GARFIELD, JAMES ABRAM (1831-81). Twentieth President of the United States. He was born at Orange, Cuyahoga County, Ohio, November 19, 1831; was early left fatherless, and spent his youth in alternate periods of study at school and hard manual work for his own support. He worked on a farm; is said to have driven horses for a time on the Ohio Canal; learned the carpenter's trade, and worked at it during his school vacation in 1850. He had already entered the Geauga Seminary at Chester, Ohio, where he began the study of Latin, Greek, and algebra. In 1851 he entered the Western Reserve Eclectic Institute (now Hiram College) at Hiram, Ohio, and in 1854 entered Williams College, Mass., where he graduated with distinguished honor in 1856. He then became teacher of Latin and Greek in the institute at Hiram, Ohio, of which he was elected the head one year later. Before entering college, he had united with the Disciples Church, in which he had been brought up, and, according to the usage of that denomination, though never formally ordained to the ministry, he often preached. In 1858 he entered his name as a student with a law firm in Cleveland, Ohio, though his study was carried on by himself at Hiram. Having taken some part as a Republican in the campaign of 1856, he was

in 1859 elected to represent the counties of Portage and Summit in the State Senate. In August, 1861, he was appointed lieutenant-colonel of volunteers, and in September colonel. In December he reported for duty to General Buell at Louisville, Ky., and was ordered in command of a brigade of four regiments of infantry, to repel the Confederates under General Marshall from the valley of the Big Sandy River. He accomplished the task in January, 1862, defeating Marshall in the battle of Middle Creek, and forcing him to retreat from the State. He was commissioned brigadier-general, was placed in command of the Twentieth Brigade, and was ordered to join General Buell. He reached, with his brigade, the field of Shiloh on the second day of the battle, and aided in the final repulse of the enemy; and next day, at the front with Sherman, took part in the attack on the enemy's rear guard. He participated in the siege of Corinth, and, after its evacuation, was detailed to rebuild the railroad to Decatur. In October, 1862, he served on a court of inquiry, and in November on the court-martial which tried General Fitz-John Porter. In February, 1863, he joined the Army of the Cumberland under Rosecrans, just after the battle of Stone River, and was appointed chief of staff. In the discussion with regard to a forward movement, Garfield, as chief of staff, collated the written opinions of the seventeen corps, division, and cavalry generals, and summarized their substance with cogent arguments of his own. This report induced Rosecrans to move forward, contrary to the opinions of most of his generals, in the Tullahoma campaign, opening the way for the advance on Chattanooga. In the battle of Chickamauga, September 19th, Garfield issued the orders, as chief of staff, and after the retreat of the right of the army rode under fire across country, and took word to Thomas, commanding the left wing, of the necessities of the situation, and, under Thomas, assisted in retrieving the disaster. Garfield was sent to Washington with dispatches, and was promoted to be a major-general for his services in the battle.

Having been elected a Representative in Congress, he resigned his commission December 3, 1863, and took his seat in the House of Representatives, where he served as member of the Military Committee until the close of the war. Largely through his efforts and arguments, the commutation clause of the Enrollment Act was repealed, and the draft enforced at a time when otherwise the army would have been fatally depleted. In 1865 he was assigned to the Committee of Ways and Means, and on March 16, 1866, made an elaborate speech on the public debt and specie payments. In 1867-68, as also later, he took strong ground against the improper inflation of the currency. In December, 1867, he returned to the Military Committee as chairman, and held that place during the discussions on the reconstruction of the Southern States, delivering a speech January 17, 1868, on the power of Congress in this relation, in which he severely criticised the action of the President, and the course of Major-General Hancock in his celebrated 'Order No. 40.' He also sustained the motion to impeach the President. Later he was chairman of the Committee on Banking and Currency, and of a special committee to investigate the cause of the gold panic in September, 1869, which cul-

minated in the crisis of 'Black Friday.' He also draughted a bill for the taking of the census of 1870, which was rejected by Congress, but was made the basis of the law passed ten years later for the census of 1880. In 1871-75 he served as chairman of the Committee on Appropriations, and in this capacity introduced many important reforms. In 1873 charges of corruption were made against him in relation to the *Crédit Mobilier* (q.v.). These attracted attention throughout the country, and especially in his own Congressional district. After earnest discussion he was renominated by the three-fourths vote of the convention, and was reelected by a large majority. The charges were renewed two years later, but were met with greater strength. In 1876 there was no opposition in the convention, and in 1878 he was reelected by a large majority. In the Forty-fourth Congress (1875-77) the Democratic Party was in the majority. Garfield became a member of the Committee of Ways and Means. He was a frequent and careful speaker on important measures, and was recognized as one of the leaders of the minority. After the Presidential election of 1876, he was one of the prominent Republicans requested to witness the counting of votes in Louisiana, and one of two Republican members appointed by the House of Representatives to sit in the Electoral Commission (q.v.). In December, 1876, he was nominated by his party for Speaker of the House of Representatives, and received the same nomination on two subsequent occasions. In the Forty-fifth Congress (1877-79) he earnestly advocated the resumption of specie payments, and spoke against the Bland Silver Bill. In 1880 he was elected by the Ohio Legislature United States Senator for six years from March 4, 1881.

In the Republican national convention at Chicago, June, 1880, he was an earnest advocate of the nomination of John Sherman of Ohio. The convention was divided between the advocates of General Grant and the opposition favoring James G. Blaine, John Sherman, and others. Garfield was not at first considered a candidate, but after more than thirty ballots without a choice, and earnest discussion in which, as well as in the advocacy of his favorite candidate, he won the admiration of delegates from all sections, he received the nomination. In November he received 214 electoral votes as against 155 for his opponent on the Democratic ticket, Gen. Winfield S. Hancock, and was inaugurated on March 4, 1881. With the single exception of Robert T. Lincoln, Secretary of War, his Cabinet, headed by James G. Blaine, as Secretary of State, was drawn from that wing of the Republican Party of which Garfield himself was a member, and which antagonized the so-called 'Stalwarts' (q.v.), among whom the Vice-President, Arthur, ranked himself. Both in public and in private, however, Garfield had signified his earnest desire to unite all factions in support of his Administration, and the people in general were disposed to trust in his promises. On March 23d the President sent in the name of William H. Robertson as his appointee to the office of Collector of the Port of New York. As Mr. Robertson was known to be a political enemy of Senator Conkling, the leading spirit among the 'Stalwarts,' Conkling looked upon the nomination as an affront to himself, and when he found that he could not pre-

vent the Senate from confirming it, he and his colleague, Thomas C. Platt, resigned their offices (May 16th) and returned to New York to seek vindication by reelection. The New York Legislature, however, refused to reelect either one, and after a long and tedious struggle Messrs. Lapham and Warner Miller were chosen in their stead. Meanwhile the President's nomination had been confirmed in the Senate, and the breach between the Stalwarts and the Administration was hopelessly widened. On July 2d Charles J. Guiteau, a man whose vanity had been offended by the refusal of an office, and whose unbalanced brain had been excited by the dissensions in the Republican Party, shot Garfield in the railway station at Washington. The crime excited the horror and execration of all parties alike; and foreign nations joined in the universal sorrow and indignation. For eighty days Garfield lingered between life and death. Toward the end of August his medical attendants felt that his last chance of recovery depended on his removal from the malarious climate of Washington, and on September 6th he was taken by train to Elberon, N. J., where he died thirteen days later, on the 19th. His body was taken to Washington, where it lay in state September 22d-23d, and then to Cleveland, Ohio, where it was buried, September 26th. A subscription started in New York for the bereaved family soon reached the sum of \$360,000. The assassin Guiteau was convicted after a protracted trial in which the only defense offered was that of insanity, and was hanged in the jail at Washington on June 30, 1882.

Many of Garfield's speeches were published at the time of their delivery, and after his death B. A. Hinsdale collected his writings and published them in two volumes (Boston, 1882). For his biography, consult: Gilmore (New York, 1880); Coffin (Boston, 1880); Bundy (New York, 1880); Mason (London, 1881); and Stoddard (New York, 1889).

GARFIELD MONUMENT. A monument at Cleveland, Ohio, in memory of the martyred President, dedicated May 30, 1890. Its cost, \$135,000, was defrayed by popular subscription. The monument is a round tower, 50 feet in diameter and 148 feet high, containing a marble statue of Garfield.

GARFISH. See GAR.

GARGAMELLE, găr'gă'měl'. The wife of Grangousier and mother of Gargantua. In Rabelais's romance, *Gargantua et Pantagruel*.

GAR/GANEY. A European teal duck (*Querquedula circia*) resembling the American blue-winged teal (see TEAL), which never ranges far north of Central Europe, but is known eastward to China. It is also called 'summer teal,' and in Italy 'garganello.'

GARGANO, găr-gă'nô (Lat. *Garganus*). A peninsula on the east coast of South Italy, called both Monte Gargano and Monte Sant' Angelo. It is an almost treeless mass of mountains, separated from the rest of the Apennines by the broad valley of the Candelaro, while it is washed on three sides by the Adriatic. It is 54 miles long, 27 miles broad, and in Mount Calvo rises to the height of 3465 feet.

GARGANTUA, Fr. pron. găr'gă'n'tu'ă. A leading character in Rabelais's satire, *The Grand*

and *Inestimable Chronicles of the Grand and Enormous Giant Gargantua* (1531). He appears also in another *Gargantua* (1535), the first part of the work now known as *Gargantua and Pantagruel* (1532-64). See RABELAIS.

GARGAPHIA. The name of a valley near Platæa in Greece, the place where Actæon was torn to pieces by his own hounds. Jonson has also employed it as the scene of his comedy *Cynthia's Revels*.

GAR/GARA, or GAR/GARUS. See IDA.

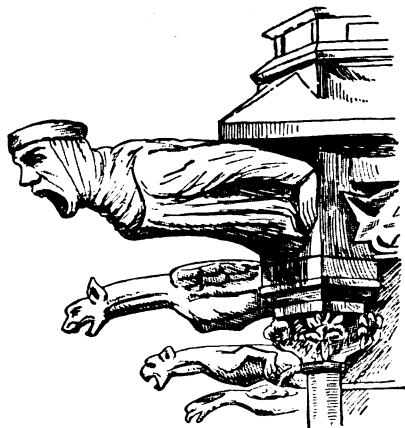
GAR/GERY, JOE. A simple-minded, open-hearted blacksmith, in Dickens's *Great Expectations*, who suffers much from the shrewish tongue of his virago wife, Pip's sister, and has an innocent desire for 'larks.'

GARGET, gâr'gêt. See MAMMITIS.

GARGET-ROOT. See PHYTOLACCA.

GARGLE, or GAR/GARISM (OF. *gargouille*, throat, from Lat. *gurgulio*, gullet). One of a group of medicines intended not to be swallowed, but to be ejected from the mouth after having been churned about in the mouth and throat, with a view to cleansing the parts when affected with discharges from ulcers, or to acting as astringents (q.v.) or stimulants (q.v.) in sore throat. The best gargles are composed of boric acid solution, or alcohol and water; of chlorine water or solution of permanganate of potash, in putrescent cases; of port wine, alum, and capsicum (cayenne pepper), when a stimulating effect is required; of tannin or oak-bark decoction with alum or borax, in case a pure astringent is needed. Gargles are very useful in the later stages of sore throat, in almost all its varieties.

GARGOYLE (OF. *gargouille*, *gargouille*, Fr. *gargouille*, throat, connected with Lat. *gurgulio*, throat). A projecting spout, discharging the water from the roof-gutters of buildings. Gargoyles of various forms have been used in almost all styles of architecture. Early examples are found in the temples of Edfu and Denderah in



GARGOYLES

decorating the Sacristy of the Cathedral of Notre Dame at Paris.

Egypt. Those of painted terra-cotta and of marble, often in the shape of lions' or boars' heads, were a prominent part of classic and Etruscan temples. But the term is especially

applied to the varied development of the spout in connection with Gothic architecture. The gargoyles of French buildings have usually great prominence, much more than in England. Some gargoyles are small and plain, others large and ornamental, according to their various positions. They are carved into all conceivable forms—angelic, human, bestial, and grotesque; and as in fountains, the water is generally spouted through the mouth. The mediæval love of the grotesque found congenial expression in creating weird and deformed heads and figures for them. Some of them are famous, as at Saint Jacques and Notre Dame in Paris. In late castellated buildings they frequently assume the form of small cannons projecting from the parapet. In modern times the use of metal pipes to convey the water from roofs has almost entirely superseded the use of gargoyles.

GARIBALDI, gû'rê-bâl'dê, GIUSEPPE (1807-82). An Italian patriot and liberator, born at Nice, July 4, 1807. He was a sailor's son, and adopted the sea as his own calling, and as early as 1830 was in command of a brig. It was about this time that he became interested in the Italian national movement, which afterwards became the great passion of his life. He made the acquaintance of Mazzini and other leaders of Young Italy in 1833, and became imbued with an unquenchable hatred of despotism. He was compromised by his participation in the futile outbreak at Genoa in 1834, and fled to French territory, while his condemnation to death was published in Italy. He resumed his sea-faring life, and sailed to South America, where he took an active part in the struggle of the new Republic of Uruguay, against the Argentine dictator, Manuel Rosas. He distinguished himself as an intrepid partisan leader on sea and land, and contracted a romantic marriage with Anita, the remarkable woman who for several years shared his campaigns. Upon receiving news of the rising of Northern Italy against Austria in 1848, Garibaldi hastened to Europe to share in the struggles of his countrymen. He bore an effective part in the whole of the Sardinian campaign as the commander of a volunteer corps. He then joined the Revolutionary Government at Rome, and distinguished himself by his defense of the city against the French forces under Oudinot in June and July, 1849. After a retreat of unparalleled difficulty through districts occupied by Austrian forces, Garibaldi, accompanied by his heroic wife, set sail in a small fishing craft toward Venice; but being pursued by Austrian vessels, they were compelled to land where they could, and, not far from the shore, his wife, exhausted by the dangers and terrible exertions of their flight, expired in the arms of her husband. Garibaldi at length reached Genoa in safety, and thence embarked for Tunis. He afterwards lived in Staten Island, N. Y., supporting himself by making candles in a factory, revisited South America, and commanded an American trading-vessel on the Pacific coast.

Though a republican by conviction, Garibaldi did not follow Mazzini in opposition to the Sardinian monarchy, but accepted it, as the hope of Italy, in the years preceding the war of 1859. As the head of an irregular auxiliary force of the Piedmontese army on the commencement of hostilities in 1859 his services were brilliant and ef-



GIUSEPPE GARIBALDI

fective, notwithstanding the limited scope assigned for his operations. In 1860 he undertook the most momentous enterprise of his career. After the disappointing peace of Villafranca had defeated the hope of liberation from the Austrian yoke just when it seemed to be approaching realization, the Italian people resumed the revolutionary operations which had been temporarily suspended in the hope that Italian unity would be accomplished through the efforts of Sardinia. In Sicily, early in 1860, disturbances broke out and Francesco Crispi (q.v.) obtained from Garibaldi a promise of assistance. In fulfillment of this promise, Garibaldi assembled at Genoa a volunteer force of 1070 patriots, and on May 5th set sail for the island of Sicily. On the 11th his two small transport steamers reached Marsala in safety, and the landing of his followers was successfully effected in sight and partially under the fire of the Neapolitan fleet. On the 15th, in the battle of Calatafimi, 3600 Neapolitan troops were routed by Garibaldi's small force, and this opening victory cleared the way to Palermo. On the 27th of the same month Garibaldi and his little army occupied the heights which commanded Palermo, and after a desperate conflict with the royalist troops fought their way into the city, which for several subsequent days had to sustain a ruthless bombardment from the united fire of the Neapolitan garrison and fleet. The intervention of the British fleet, however, and the isolated and destitute condition of the garrison shut up in the forts, induced the Neapolitan general to capitulate June 6th, and on his departure with his troops Garibaldi remained in undisputed possession of the city and strongholds of Palermo. He issued a proclamation as dictator in the name of Italy and Victor Emmanuel, armed the citizens, and on July 20th, at the head of 2500 men, he gave battle at Milazzo to 7000 Neapolitans, who were completely defeated, and compelled to evacuate that fortress. On the 25th the Neapolitans were driven back into Messina, into which Garibaldi made his triumphal entry on the 27th.

On August 19th Garibaldi crossed over into Calabria, and was immediately joined by large bodies of volunteers from all directions, by whom he was accompanied on his memorable and eventful march to Naples. On September 5th his army, which then amounted to 25,000 or 30,000 men, occupied Salerno on the withdrawal of the royalists, and on the 7th, amid the frenzied enthusiasm of the inhabitants, Garibaldi entered Naples with only one or two friends, to prove to Europe that his advent was that of a welcome liberator, and not of a conqueror. On the previous day the capital had sullenly witnessed the withdrawal of the King, Francis II., to the fortress of Gaeta. On the 1st of October the royalist troops, numbering 15,000 men, advanced from Capua, and attacked the whole line of Garibaldians spread along the Volturno. For some hours the outcome of the battle was in doubt, and more than once it seemed as if success were about to desert the patriots at the last moment; but finally the royalists were driven back to Capua in disorder. Victor Emmanuel, at the head of the Sardinian army, now crossed the Papal frontier, routed the troops under Lamoricière, and passed on into the Kingdom of Naples, where Garibaldi relinquished into his sovereign's hands the unconditional disposal of his army, and absolute

sway over the Neapolitan provinces. Francis II. was now besieged by the Sardinian forces in his stronghold of Gaeta, where on February 13, 1861, he was compelled to surrender to Victor Emmanuel. Garibaldi retired to Caprera, but in June, 1862, he raised a force of volunteers at Palermo, invaded Calabria, and marched upon Rome, which he believed must be wrested from the Pope before the unity of Italy could be accomplished. Victor Emmanuel, however, fearing that Garibaldi's attempt on Rome would bring about foreign intervention with disastrous consequences to Italy, dispatched an army to check his progress. Garibaldi was defeated by the Italian troops at Aspromonte August 29th, and taken prisoner, but was pardoned in October.

During the campaign of 1866 Garibaldi took the field, and was engaged in operations against the Austrians in the Tyrol. The year 1867 was disastrous for him. Impatient of the long delays in completing the unification of Italy, and bitterly opposed to the Papal power, he organized an open invasion of the Papal States, which the Italian Government could not countenance. France came to the aid of the Pope, the Garibaldians were defeated at Mentana, November 3d, and their leader was made a prisoner, but was afterwards allowed to return to Caprera, in the neighborhood of which a man-of-war was stationed to prevent his escape. He left Caprera to fight for the French Republic in 1870, and was nominated to the command of the irregular forces in the region of Burgundy. In 1871 he was returned a Deputy to the French National Assembly which met at Bordeaux, but encountered such bitter criticism of his conduct during the war that he returned to Caprera. He entered the Italian Parliament in 1874. After much hesitation he accepted from the Parliament an annual pension of 10,000 lire. In 1860 Garibaldi was inveigled into an unhappy marriage, which was annulled in 1879, when he married Francesca, a peasant, who had been an inmate of his family for many years. He died at Caprera June 2, 1882. Garibaldi's novels, *Clelia* and *Cantoni il volontario*, have little literary value. Of his two sons, the elder one, Menotti, fought with credit by his father's side.

BIBLIOGRAPHY. A comprehensive literature centres about Garibaldi, and only the most useful and accessible books may be mentioned. The first in importance is naturally Garibaldi's own *Memoirs*, translated into English by Werner, and published under the title, *Autobiography of Giuseppe Garibaldi* (London, 1889). This authorized edition contains a supplement by Jessie White Mario, and embodies all that Garibaldi wished to have published. Much is omitted which Garibaldi preferred not to discuss, and there are many minor errors, as the memoirs were written entirely from memory, without verification of dates and other facts. The volumes are, nevertheless, of great value. Dwight, *Life of General Garibaldi, Translated from His Private Papers* (New York, 1877), is also autobiographical. Consult also: Bent, *The Life of Giuseppe Garibaldi* (London, 1881); Marriott, *The Makers of Modern Italy* (New York, 1889), which includes three Oxford lectures, one on Garibaldi. See ITALY.

GARIBALDI (so called from its color, red having been worn by adherents of Garibaldi). A

name in California for the red perch (*Hypsypops rubicundus*).

GARIEP' RIVER. See ORANGE RIVER.

GARIGLIANO, gä'rë-lyä'nô (Lat. *Liris*, earlier *Clanis*). A river of South Italy, 92 miles long, which rises in the Abruzzi as the Liri (Map: Italy, H 6). It receives the waters of the Sacco, the Melsa (at this point changing its name to Garigliano), and the Rapido, and then flows sluggishly through marshes, past the ruins of Minturnæ, into the Gulf of Gaeta. In the marshy swamps near the river Marius found concealment when pursued by Sulla. On its banks in 1503 the Spaniards, under Cordova, won a famous victory over the French. On November 3, 1860, the Neapolitan troops north of the river were defeated by the Sardinians, and as a result the investiture of Gaeta began.

GARIGUE, gä'rëg' (Fr., uncultivated land, Cat. *garriga*, from *garrig*, oak). A term applied to the barren and rocky desert-like areas of the Mediterranean region, where neither shrubs nor trees give tone to the landscape.

GARLAND, AUGUSTUS HILL (1832-99). An American politician. He was born in Tipton County, Tenn., but when less than a year old was taken by his parents to Arkansas. He was educated at Saint Mary's College, Lebanon, Ky., and at Saint Joseph's College, Bardstown, Ky., studied law, and was admitted to the Arkansas bar in 1853, and soon became prominent both as a lawyer and politician. In politics he was a Whig, and was opposed to secession, but finally went with his State. He was elected to the Provisional Congress of the Confederate States in 1861; was reelected to the House of the same Congress in 1862, and was afterwards elected to the Confederate Senate, of which he continued to be a member until the close of the war. He then devoted himself to his profession, and in 1874 was elected Governor of Arkansas, under the new Constitution. He was a member of the United States Senate from 1877 to 1885, and from 1885 to 1889 was Attorney-General of the United States in the Cabinet of President Cleveland, after which, until his death, he practiced law in Washington, D. C.

GARLAND, HAMLIN (1860—). An American poet and story-writer, born at La Crosse, Wis., September 16, 1860, of Scotch descent. His youth was passed in various Western towns, among them the Quaker community Hesper, Iowa. He completed his school education at Cedar Valley Seminary, Osage, Iowa, in 1881, farmed and taught in Illinois and Dakota, went to Boston in 1884, and devoted himself to literature there till 1891, since when he has lived chiefly in the West. His first book was *Main-Traveled Roads* (1891), frankly realistic fiction. Somewhat similar in character are: *A Spoil of Office* (1893); *Prairie Folks* (1893); *A Little Norsk* (1893); and *Rose of Dutcher's Coolly* (1895), probably his best novel. Other novels are: *Jason Edwards* (1891); *A Member of the Third House* (1892); *Wayside Courtships* (1897); *Her Mountain Lover* (1901). He has also written a volume of vigorously iconoclastic criticism entitled *Crumbling Idols* (1894); *Prairie Songs* (1893), a volume of verse; *Ulysses Grant: His Life and Character* (1898), a

sympathetic biography; *The Trail of the Gold Seekers* (1899); *The Eagle's Heart* (1900); and *Captain of the Gray Horse Troop* (1902).

GARLAND, LONDON CABELL (1810-95). An American educator, born in Nelson County, Va. He graduated in 1829 at Hampden-Sidney College (Farmville, Va.) in 1833, was appointed professor of physics in Randolph-Macon College (Ashland and Lynchburg, Va.), and from 1835 to 1847 was president of that institution. In 1847-53 he was professor of mathematics and astronomy in the University of Alabama (University, Ala.), of which he was president from 1855 to 1866. Professor of physics and astronomy in the University of Mississippi (Oxford) from 1866 to 1875, he was appointed in the latter year chancellor of Vanderbilt University (Nashville, Tenn.), and professor there of physics and astronomy. He resigned from the chancellorship in 1893. He published *Trigonometry, Plane and Spherical* (1841), one of a projected series of text-books, the remaining manuscripts of which were destroyed by fire.

GARLIC (AS. *gärlëac*, from *gär*, spear + *lëac*, leek, so called from the shape of the leaves), *Allium sativum*. A bulbous-rooted plant, native of the East, cultivated from the earliest ages. The stem rises to the height of about two feet, is unbranched, and bears at the top an umbel of a few whitish flowers, mixed with many small bulbs. The leaves are grass-like, obscurely keeled, and not fistulous like those of the onion. The bulb, which is the part eaten, consists of about twelve to fifteen ovate-oblong cloves or subordinate bulbs. It has a penetrating and powerful onion-like odor and taste. It is in general use as a condiment with other articles of food in Southern Europe, but has only a limited use in the United States. Garlic, or its fresh juice, is also used in medicine. It owes its properties chiefly to oil of garlic. The cultivation of garlic is extremely easy; it is generally propagated by its cloves. Many species of the genus *Allium* are popularly called garlic, with some distinctive addition. *Allium oleraceum* is sometimes called wild garlic in England, and its young and tender leaves are used as a pot-herb. Its leaves are semi-cylindrical, and grooved on the upper side, and its stamens are all simple. In America, wild garlic is *Allium ceneale*, a perennial also known as field garlic and wild onion. This is a serious weed pest in pastures, hay and grain fields of the Eastern United States from New York to South Carolina. When eaten by cattle it imparts a very disagreeable odor and flavor to the milk, butter, cheese, and other dairy products. The species has hollow, thread-like leaves surrounding a slender scape, which bears an umbel of greenish-white or rose-colored flowers in mid-summer, which are followed in early autumn by either seeds or bulbets. The easiest way to eradicate it in fields is to alternate heavy cropping with clean cultivation. See ALLIUM; ALLIACEOUS PLANT; Plate of ONIONS, ETC.

GARLIC, OIL OF. When cloves of garlic are distilled with water, about 0.2 per cent. of a brown heavy oil, with an acrid taste and a strong disagreeable smell, passes over. By careful rectification from a salt-water bath, about two-thirds of the oil may be obtained in the form of a yellow liquid, which is lighter than

water, and which, when treated with chloride of calcium (in order to dry it), and subsequently distilled from fragments of potassium, passes over pure and colorless as sulphide of allyl, an organic compound of very considerable interest, whose formula is $(C_3H_5)_2S$. The crude oil also contains a compound of allyl still richer in sulphur than the sulphide. Sulphide of allyl exists not only in oil of garlic, but also in the oils of onions, leeks, cress, alliaria, radishes, asafetida, etc. It is a light, clear, pale-yellow oil, with a penetrating odor of garlic; it boils at $140^\circ C.$, and dissolves readily in alcohol and ether.

GARMAN, SAMUEL (1846—). An American naturalist, born in Indiana County, Pa. He graduated in 1870 at the Illinois State Normal University, was principal of the Mississippi State Normal School in 1870-71, was a pupil of Louis Agassiz in special work in natural history (1872-73), and received appointment as assistant in the departments of herpetology and ichthyology at the Museum of Comparative Zoölogy, Cambridge. His writings include: *Fishes and Reptiles from Lake Titicaca* (*Bulletin of the Museum*, vol. iii., 1871-76, No. 11); (joint author) *Exploration of Lake Titicaca* (ib., vol. iii., 1871-76, Nos. 11, 12, 15, and 16); *On Certain Species of Chelonioidea* (ib., vol. vi., 1879-80, No. 6); *New Specimens of Selachians in the Museum Collection* (ib., vol. vi., 1879-80, No. 11); *The Reptiles and Batrachians of North America* (*Memoirs of the Museum*, vol. viii., 1883, No. 3); and *Reptiles and Batrachians of the West Indies* (1887; printed in the *Bulletin of the Essex Institute*, and in monograph form).

GARNEAU, gâr'nô', FRANÇOIS XAVIER (1809-66). A Canadian historian, born in Quebec. Admitted in 1830 as a notary, he was appointed clerk to the Legislative Assembly, and from 1844 to 1864 was clerk to the municipal council of Quebec. He published an *Histoire du Canada, depuis sa découverte* (1845-48; 2d ed., revised and corrected, 1852; 3d ed. 1859), of which an unsatisfactory English translation by A. Bell appeared at Montreal in 1860 (2d ed. 1862). He also wrote *Voyage en Angleterre et en France* (printed in the *Journal de Québec* in 1855), and contributed to periodicals numerous poems, collected in part in Huston's *Recueil de littérature canadienne* (Montreal, 1848). Consult Casgrain, *Biographie de F. X. Garneau* (Montreal, 1886).

GARNET (ME. *garnet*, *grenat*, from OF. *grenat*, It. *granato*, from ML. *granatus*, garnet, either on account of its crimson color, from ML. *granata*, cochineal insect, supposed to be a seed or berry, or from Lat. *granatum*, pomegranate, as resembling in shape and color pomegranate seeds; in either case from Lat. *granum*, grain). An orthosilicate of varying composition that crystallizes in the isometric system. Some varieties of garnet are not quite so hard as quartz, others are considerably harder. When crystallized, garnets have a vitreous to resinous lustre. They occur in schists and slates, and in gneiss, granite, and limestone, and sometimes in lava and serpentine, being usually of secondary origin. Garnets are divided by Dana into three groups; viz. aluminum garnets, iron garnets, and calcium-chromium garnets.

The first group includes grossularite, or cal-

cium-aluminum garnet; pyrope, or magnesium-aluminum garnet; almandite, or iron-aluminum garnet; and spessartite, or manganese-aluminum garnet. Grossularite, sometimes called essonite, or hessonite, or cinnamon stone, varies in color from white to different shades of yellow and brown, and from pale-green to emerald-green. Gem varieties of the green grossularite are obtained in Siberia, and the brown-colored ones, or cinnamon stones, are found in Ceylon, where they are sometimes miscalled hyacinth. In the United States green varieties have been found at Brewster, N. Y., and red and yellow varieties in Phippsburg, Me., and Warren, N. H.; also at various places along the Alleghany range. A rose-red variety of grossularite, called rose garnet, from Xalostoc, Mexico, is used as an ornamental material when cut and polished. Pyrope, which is called precious or Oriental garnet, is of a deep-red to black color. The best known varieties are found at a number of places in Bohemia; excellent specimens are also obtained at the Kimberley mines in South Africa. In the United States, the finest pyrope garnets come from Arizona, southern Colorado, and New Mexico, where they are often called Arizona rubies, while the varieties from South Africa are known as Cape rubies. Almandite, which is the common garnet, varies in color from deep red to black. The transparent scarlet and crimson varieties, when cut, are called carbuncles; these were highly prized by the ancients. According to the Talmud, the only light that Noah had in the Ark was furnished by carbuncles. The finest almandite garnets are from Siriam, India; from Burke, Caldwell, and Catawba counties, N. C.; and from Idaho. The specimens found in the United States, although inferior to those from India, are generally of good enough quality to be used as watch-jewels.

Spessartite is of a dark hyacinth-red to brownish-red color; it is found in the Ural Mountains and in Amelia County, Va.

The second group comprises the garnets which have the general name of andradite. They range in color from light-yellow through various shades of green to red, brown, and black, and according to their colors they have special names, among which are demantoid for the green variety, and melanite for the black variety. They are found variously throughout the world, chiefly along mountain ranges.

The last group is formed by uvarovite, or calcium-chromium garnet, which is of an emerald-green color, and is found in Siberia, as well as at various localities in Canada.

According to their transparency and richness of color, garnets are cut and used for gem purposes. Among the ancients, garnets—especially the precious varieties—were cut and polished into various ornaments. Pliny describes a vessel formed from carbuncles, having the capacity of a pint. A number of fine ancient specimens of engraving on garnets are to be found in the larger collections. The common garnet is frequently ground and used for polishing and cutting other stones, and also for the manufacture of sand-paper. About 3000 tons of garnets for abrasive purposes are produced annually in the United States from mines in New York, Pennsylvania, and Massachusetts, the greater number of which are used in the shoe industry. Garnets of the

gem variety have been made artificially in Paris by the fusion of their constituents.

GARNET, HENRY HIGHLAND (1815-82). An Afro-American clergyman and orator, born a slave in New Market, Md. He was a pure-blooded negro of the Mendigo tribe. When he was ten years old his parents successfully escaped from Maryland, taking him with them, and in 1826 settled in New York City. He was educated at Canaan Academy, New Hampshire, and at Oneida Institute, near Utica, N. Y. After graduating at the latter institution in 1840, he studied theology, and two years later became pastor of a Presbyterian church in Troy. He became actively associated with the leaders of the abolition movement, and published for a time the *Clarion*, a weekly paper devoted to the cause. In 1850 he went to Europe, and spent the greater part of the next three years lecturing on the slavery question in Great Britain. He was a delegate to the peace congress at Frankfort in 1851, and in 1853 was sent to Jamaica as a missionary by the United Presbyterian Church of Scotland. In 1855 he returned to the United States to take charge of the Shiloh Presbyterian Church in New York City. There he remained until 1881, with the exception of a four years' pastorate at Washington, D. C., in 1865-69. Shortly before President Garfield's assassination he was appointed by him Minister Resident and Consul-General for the United States in Liberia. The appointment was renewed by President Arthur and confirmed by the Senate, but Garnet died a few months after taking charge of his new post.

GARNETT. A city and the county-seat of Anderson County, Kan., 50 miles northwest of Fort Scott; on the Missouri Pacific and the Atchison, Topeka and Santa Fé railroads (Map: Kansas, G 3). It has considerable trade in the products of the surrounding agricultural region, and manufactures furniture, flour, lumber, etc. Population, in 1890, 2191; in 1900, 2078.

GARNETT, JAMES MERCER (1840—). An American educator, philologist, and author, born at Aldie, Va. He graduated at the University of Virginia in 1859, served in the Confederate Army during the Civil War, and rose to be captain of artillery, and in 1867 was appointed professor of Greek in the Louisiana State University (then at Alexandria, now at Baton Rouge). Subsequently he was instructor in ancient languages and mathematics at the Episcopal High School (near Alexandria, Va.). From 1870 to 1880 he was president of Saint John's College (Annapolis, Md.), and from 1882 to 1896 professor of English literature in the University of Virginia. He was elected president in 1890 of the American Dialect Society, and in 1893 of the American Philological Association. He edited *Selections in English Prose* (1891); his other works include: *Translation of Beowulf* (1882, 1900); *Elene and Other Anglo-Saxon Poems* (1889-1900); and a *History of the University of Virginia* (1901).

GARNETT, RICHARD (1835—). An English librarian and author, born in Lichfield. He entered the service of the British Museum under Panizzi when he was sixteen years old, became superintendent of the reading room in 1875; and from 1890 to 1899 was keeper of printed books. From 1881 until 1890 Dr. Garnett had charge of

the preparation and printing of the great catalogue of authors of the museum. He has been president of the Library Association of the United Kingdom and of the Bibliographical Society. In his professional field he has edited the series of manuals entitled the "Library Series," to which he contributed *Essays in Librarianship and Bibliography* (1899). He has published several volumes of verse, including *Io in Egypt* (1859); *Iphigenia in Delphi* (1891); *Poems* (1893); and *The Queen and Other Poems* (1901). To the "Great Writers Series" he contributed lives of *Carlyle* (1887), *Emerson* (1888), and *Milton* (1890). Among his other works are: *Relics of Shelley* (1862); *The Twilight of the Gods and Other Tales* (1889); *Age of Dryden* (1895); *William Blake, Painter and Poet* (1895); *A History of Italian Literature* (1898); and *Essays of an Ex-Librarian* (1901). He was editor of the *International Library of Famous Literature*, and contributed many articles to the *Dictionary of National Biography* and the *Encyclopædia Britannica*. In collaboration with Edmund Gosse he published in 1902 *An Illustrated History of English Literature*.

GARNETT, ROBERT SELDEN (1819-61). An American soldier, born in Essex County, Va. He studied at the United States Military Academy; was appointed brevet second lieutenant of the Fourth Artillery in 1841; in 1841-42 was on duty on the northern frontier during the Canadian border troubles; and after serving as instructor in infantry tactics at the Military Academy (1843-44), and in the military occupation of Texas (1845-46), fought through the Mexican War. From 1846 to 1849 he was aide-de-camp to Major-General Taylor, and in 1847 was brevetted major for gallant and meritorious conduct at Buena Vista. In 1852-54 he was commandant at the Military Academy; in 1855 was promoted to be major; and in 1861 resigned from the United States Army, and was appointed a brigadier-general in the Army of the Confederate States. Placed in command of the forces in western Virginia, he was obliged to fall back before the superior numbers of the Federal troops under Major-General McClellan; was pursued and overtaken at Carrick's Ford (q.v.) (on the river Cheat), and was killed in the ensuing combat (July 13, 1861).

GARNIER, gār'nyā', JEAN JACQUES (1729-1805). A French historian, born at Gorron (Mayenne). Having arrived at Paris on foot, he entered the Minorite Order, and finally became adjunct professor of Hebrew in the Collège de France, of which in 1768 he was appointed inspector. In 1761 his memoir, *Traité de l'origine du gouvernement français*, was crowned by the Academy of Inscriptions, to which he was elected as associate. He was successor to Claude Villaret as historiographer of France, and wrote a continuation (1765-85) of the *Histoire de France* of Velly and Villaret. His further publications include an interesting work on *L'homme de lettres* (1764), and a treatise, *De l'éducation civile* (1765).

GARNIER, JEAN LOUIS CHARLES (1825-98). A French architect, born in Paris. He studied under Lévêil and Lebas at the Ecole des Beaux-Arts, and won the Prix de Rome for architecture in 1848. Afterwards he traveled extensively in Greece, Turkey, and Italy. In 1860 he was

architect for a section of Paris. A year later he won the competitive prize for plans for the new Opera House in Paris, which was fourteen years in building. Its style has been called 'bastard Renaissance.' The main feature of the building is the stairway. It contains decorative paintings by Baudry, Pils, and others, and is adorned with sculpture by Carpeaux, Joffroy, Guillaume, and Perraud. Garnier also built the Conservatory at Nice, the Casino at Monte Carlo, designed the tombs of Offenbach, Bizet, and Victor Massé in Paris, and, with Debacq, built the De Luynes Mortuary Chapel at Dampierre. He wrote: *Restauration des tombeaux des rois Angevins en Italie* (with 54 plates in folio); *A travers les arts* (1869); *Etude sur le théâtre* (1871); *Le nouvel Opéra de Paris* (1875-81); *Monographie de l'observatoire de Nice* (1892); and *Histoire de l'habitation humaine* (1894, with Ammann). He was a member of every architectural society of importance in France and abroad, and in 1889 was made commander of the Legion of Honor.

GARNIER, JOSEPH CLÉMENT (1813-81). A French economist. He was born at Beuil (Alpes Maritimes), studied at the Ecole du Commerce, and was appointed professor of mathematics and political economy in that institution. In 1842 he assisted in founding the French Society of Political Economy, and in 1846 the French Free-Trade Association. From 1845 to 1855, and from 1866 until his death, he was editor of the *Journal des Economistes*. He wrote a number of works which did much to popularize economic science in France, and which include an *Introduction à l'étude de l'économie politique* (1843); *Richard Cobden, les ligueurs et la ligue* (1846); and *Etude sur les profits et les salaires* (1848).

GARNIER, JULES ARSÈNE (1847-89). A French painter, born in Paris. He was a pupil at the Academy of Toulouse, and then of Gérôme in Paris. His works are genre and historical, and they are notable for clever composition. The best of them are: "The Right of the Seigneur" (1872); "The Tithe" (1873); "The King is Amused" (1874); "Capital Punishment" (1876); and "The Deliverer of Territory" (1878).

GARNIER, MARIE JOSEPH FRANÇOIS (1839-73), usually called Francis Garnier. A French officer and explorer, born at Saint-Etienne. He served under Admiral Charner in the French war with China, 1860-62, and remained in the new colony of Cochin-China as a civil officer. In 1866 Captain Doudart de Lagrée commanded an exploring expedition from the coast of Cambodia through Yun-nan to Shanghai with a view to increasing the opportunities for trade. Garnier accompanied him, explored the Mekong River, and on the death of the commander, successfully brought the expedition along the Yang-tse-kiang to the coast. A remarkable account of the expedition is given in his *Voyage d'exploration en Indo-Chine, pendant 1866-1868* (1873). After taking part in the defense of Paris in 1870-71, he again went to the East. Further explorations were followed by a commission from the Governor of Cochin-China to negotiate a treaty with the Viceroy of Tongking. The Viceroy, however, refused to negotiate, and Garnier, with 120 men, took Hanoi, the capital, and won further successes; but reinforcements were delayed, the

party fell into an ambushade, and Garnier was killed.

GARNIER, ROBERT (1534-90). A French dramatic poet, born at La Ferté-Bernard. He studied law at Toulouse, and held various positions under the State before he gave himself entirely to the writing of drama. His plays have little real action, and that little is clogged by the long speeches and interminable dialogues of the characters. Nevertheless, there is at times a freshness and vigor about much of his writing that suggests Corneille, and he is considered the greatest French dramatic author of his century. His works include: *Porcie, épouse de Brutus* (1568); *Les Juives* (1583); and *Bradamante* (1582). He also wrote a volume of poems, *Les plaintes amoureuses* (1565). His collected works were published in four volumes at Heilbronn in 1882-83. Consult: Bernage, *Etude sur Robert Garnier* (Paris, 1880); My-sing, *Robert Garnier und die antike Tragödie* (Leipzig, 1891); and Körner, *Der Versbau Robert Garniers* (Berlin, 1894).

GARNIER-PAGÈS, gâr'nyâ' pâ'zhès', ETIENNE JOSEPH LOUIS (1801-41). A French politician, born in Marseilles. He was admitted to the bar, in 1831 became member for Isère in the Chamber of Deputies, and in 1832 was one of the Liberals associated with Odilon Barrot in the preparation of the famous *Compte rendu*, in protest against the attitude of the Conservative Ministry. His Republicanism, however, was never violent, and his reputation was made as a prudent and forceful orator on matters of public business.

GARNIER-PAGÈS, LOUIS ANTOINE (1803-78). A French statesman, born in Marseilles. He was chosen to the Chamber of Deputies in 1841, to succeed his step-brother, Joseph Louis, and took high rank as leader of the opposition and a promoter of reform agitation. In February, 1848, he was made a member of the Provisional Government and Mayor of Paris, and in March, Minister of Finance. Circumstances forced him to extreme measures, of which the most unpopular was the celebrated tax of '45 centimes.' In May he was one of the executive committee of five appointed by the Assembly. In 1864 he was a member of the Corps Législatif, devoting himself as such especially to financial matters, and until the fall of the Empire had a part in the most important acts of the republican opposition. Having been reelected in 1869, he vigorously opposed war with Prussia, but though a member of the Government of National Defense, he played an unimportant rôle, and retired to private life in 1871. He published: *Histoire de la Révolution de 1848* (10 vols., 1861-72); *Histoire de la commission exécutive* (1869-72); and *L'opposition et l'empire* (1872).

GARNISHMENT (from *garnish*, from OF. *garnir*, *guarnir*, *uarnir*, Fr. *garnir*, from OHG. *warnôn*, Ger. *warnen*, AS. *wearnian*, Eng. *warn*). A process by which chattels, rights, or credits belonging to the defendant in an action, but which are in the possession of a third person, are seized and applied to the plaintiff's claim. The peculiarity of the process is indicated by the etymology of the term; garnishment meaning a warning or notice given to the third person not to pay money or turn over property to the

defendant. It has been called an equitable attachment of the claims or assets of a defendant in the hands of a third person. It is not a common-law process, and is regulated by statute in the States where it exists. Such statutes are, as a rule, strictly construed, and their requirements must be fully and fairly complied with by a plaintiff who would take advantage of them. It is held that only such property in the hands of the third party—the garnishee—is liable to this process as is not incumbered with trusts, and such as may be handed over or paid by the officer executing the process, under the order of the court and free from incumbrances, which can be properly determined and adjusted only by equity tribunals. Garnishment proceedings reach only such debts as are owing to the defendant at the time the process is served. A judgment obtained in a Federal court cannot be garnished in an action in a State court. Such garnishment would operate to oust the Federal court of its proper control over its own judgments. Debts owing by a public corporation to the defendant are not garnishable. If they were, municipal authorities might be compelled to occupy their time over contests in which the public had no interest. It may be laid down as a general rule that a person deriving his authority from the law to receive and hold property cannot be garnished for the same while holding it in that capacity.

As soon as the process of garnishment is duly served, the garnishee holds the property as a stakeholder or trustee. Accordingly, garnishment is known in some States as 'trustee process.' Consult Rood, *Garnishment* (1896), and the authorities referred to under ATTACHMENT.

GARO (gá'rò) or **GARROW HILLS**. Mountains overhanging the valley of the Brahmaputra (Map: India, F 3), which give their name to a western district of the Hill Division of Assam (q.v.). 3150 square miles in area, and reach their highest altitude at 4650 feet. The region has deep and extensive valleys, well watered and very fertile. Dense forests containing valuable sal trees, cover the hills, and coal is found in large quantities. Population of district, in 1891, 121,570; in 1901, 138,300. See GAROS.

GAROFALO, gá-rò'fà-lò, **BENVENUTO TISIO DA** (1481-1559). An Italian painter, born at Garofalo, near Ferrara. He studied under Panetta at Ferrara, and under Boccaccino at Cremona, and in 1499 went to Rome, where he became the pupil of Giovanni Baldini. After this he painted with Lorenzo Costa at Mantua. From 1509 to 1515 he was in Ferrara with Dosso Dossi, and then returned to Rome. Here he was an ardent admirer of Raphael. He was then called to Ferrara again, and executed for the Duke Alphonso I. some of his best paintings, such as "The Massacre of the Innocents"; "The Resurrection of Lazarus"; and "Christ on the Mount of Olives," now in the Church of Saint Francis. Until 1550 he painted at Ferrara, but many of the frescoes he did at that time have been destroyed. For the last nine years of his life he was blind. His other works include: "Virgin Enthroned," Ferrara Cathedral; "The Descent from the Cross," the Brera, Milan; "Nativity," in the Capitol, Rome; "The Marriage at Cana," the "Multiplication of the Loaves," in the Palazzo Braschi, Rome; "Virgin and

Child," in the Hermitage, Saint Petersburg; "The Triumph of Bacchus," one of his few mythological subjects, in the Dresden Museum; and "The Nativity," in the Doria Gallery, Rome. His finest works were executed in the manner of the Ferrarese School, to which he afterwards added a certain suavity, gained probably from his admiration of Raphael. His coloring is peculiarly vivid and attractive, and his pictures are most harmoniously composed.

GARONNE, gá'rún' (Lat. *Garumna*). The principal river in the southwest of France, rising within the Spanish frontier in the Val d'Aran, at the base of Mount Maladetta, in the Pyrenees (Map: France, F 7). About 26 miles from its source it enters France in the Department of Haute-Garonne, flows in a generally northeast course to Toulouse, then bends to the northwest, joined by the Dordogne about twenty miles below Bordeaux, widens into the estuary which bears the name of the Gironde, and enters the Atlantic at Pointe de Grave. Ocean steamers ascend to Bordeaux, and the river is navigable beyond Toulouse, which is connected with the Mediterranean by the Canal du Midi (q.v.). Total length, nearly 400 miles. With its 32 tributaries, the Garonne drains an area of about 38,000 square miles, and forms a system of navigable waterways of over 1400 miles, which is greater than that of any other French river. The Garonne is subject to destructive overflows. During the inundation of 1875 more than 7000 houses were destroyed.

GARONNE, HAUTE. See HAUTE-GARONNE.

GAROS, gá'ròz. A people inhabiting the region of the Garo Hills in western Assam, India. They are said to be related, physically and linguistically, to the Thai (Burmese, Siamese, etc.) stock, but have a considerable Aryan admixture, particularly in language. They have many interesting social customs, among them courtship by the woman, bridegroom-capture, etc. Besides the article by Godwin-Austen on "The Garo Hill Tribes," in the *Journal of the Anthropological Institute* (London), for 1871, reference may be made to Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872). A Bengali-Garo Dictionary was published by Ramkhe (1887).

GAR-PIKE. See GAR.

GARRARD, gár-rárd', **JAMES** (1749-1822). One of the early Governors of Kentucky. He was born in Stafford County, Va., served as a militia officer in the Revolutionary War, and was a member of the Virginia Legislature. In 1783 he removed with the early settlers to Kentucky, settling near the present Paris; and subsequently was a member of the convention which framed the first Constitution for Kentucky, and from 1796 until 1804 was Governor of the State. He was an active opponent of slavery.

GARRARD, KENNER (1828-79). An American soldier, born in Cincinnati, Ohio. He graduated at West Point in 1851, was on frontier duty and topographical duty for the most part until 1861, was captured in April, 1861, by Texan troops, and was on parole until exchanged in August, 1862. From September, 1861, to September, 1862, he was on duty at West Point, first as assistant instructor of cavalry, and afterwards (December 5, 1861, to September 25, 1862) as commandant, with the *ex officio* rank of lieu-

tenant-colonel. He became a colonel of volunteers in September, 1862; served in the Rappahannock campaign and the Pennsylvania campaign, participating in the battles of Fredericksburg, Chancellorsville, and Gettysburg; was promoted to be brigadier-general of volunteers in July, 1863, and to be major in the regular (cavalry) service in November; served in the Rapidan campaign from October to December, 1863; and from December, 1863, to January, 1864, was in charge of the Cavalry Bureau at Washington. From February to December, 1864, he commanded the Second Cavalry Division of the Army of the Cumberland, participating in the various operations about Chattanooga and in the invasion of Georgia; and from December, 1864, to July, 1865, commanded the Second Division of the Sixteenth Army Corps, and participated as such in the battle of Nashville, the capture of Blakely, and the movement upon Montgomery. In December, 1864, he was brevetted major-general of volunteers, and on March 13, 1865, he was brevetted brigadier-general in the regular army, and major-general in the regular army. He commanded the District of Mobile from August to September, 1865, was mustered out of the volunteer service in August, 1865, acted as assistant inspector-general of the Department of the Missouri from March to November, 1866, when he resigned from the service, and subsequently was a member of the Platting Commission of Cincinnati from 1871 to 1879, and of the Sewage Commission of the same city from 1875 to 1879.

GARRAUD, gá'ró', GABRIEL JOSEPH (1807-80). A French sculptor, born at Dijon. He was a pupil of Rude. His works include: "Hercule délivrant Prométhée" (1838); "Une jeune vierge avec l'enfant"; "La première famille sur la terre," in the Luxembourg Gardens; the statue of Laplace for the Observatory of Paris; and many busts.

GAR/RAWAY'S COFFEE-HOUSE. A famous London coffee-house, in Exchange Alley, Cornhill, which existed for over two hundred years. It was originally kept by one Garway, a dealer in coffee and tobacco. It is the scene of the first tea sales in London, also of the meetings of the shareholders of the South Sea Scheme, and of innumerable fashionable lotteries, sales, and exchanges.

GARRETT, ALEXANDER CHARLES (1832-). An American clergyman of the Protestant Episcopal Church, born at Ballymote, County Sligo, Ireland. He graduated at Trinity College, Dublin, in 1855; was curate of East Worldham, Hampshire (1856-59); and for the next ten years served as a missionary in British Columbia. In 1870 he became rector of Saint James's Church, San Francisco, and two years later dean of Trinity Cathedral, Omaha. In 1874 he was appointed Missionary Bishop of northern Texas, and retained the bishopric after the formation of the diocese of Dallas. He wrote: *A Charge to the Clergy and Laity of North Texas* (1875); *Historical Continuity* (1875); and the *Baldwin Lectures on the Philosophy of the Incarnation*.

GARRETT, GEORGE MURSELL (1834-97). An English organist and musical composer, born at Winchester. He studied under Elvey at Oxford, and S. S. Wesley at Winchester; from 1854 to

1857 was organist of the Madras (India) Cathedral, and in the latter year was appointed organist of Saint John's College, Cambridge. In 1875 he became organist to the university. His works include *The Shunammite*, a sacred cantata performed in 1882 at the Hereford Festival and by the Cambridge University Musical Society; church music, services, part-songs, and some compositions for the organ.

GARRETT, JOHN WORK (1820-84). An American railroad president, born in Baltimore. After pursuing a course of study in Lafayette College he entered, at the age of nineteen, upon a business life in a firm with his father and brother—Robert Garrett & Sons. He became identified with the Baltimore and Ohio Railroad as a director in 1857, and as president in 1858, and to the development of this system he devoted his energies during the remainder of his life. Under his administration the line became one of the most important means of communication between the seaboard and the interior. During the Civil War the road, which followed during much of its way the Potomac River, was crossed and recrossed by the contending armies, and was frequently broken by the Confederate forces. But the repairs were quickly made, and the road continued to be of the greatest service to the United States Government in the transportation of troops and materials. Mr. Garrett was closely associated with Johns Hopkins (founder of the university and the hospital which bear his name). He was one of the original trustees of the Johns Hopkins Hospital and University, and a liberal contributor to the Young Men's Christian Association, the Maryland Institute, and the Association for the Improvement of the Condition of the Poor. His son Robert succeeded to the presidency of the Baltimore and Ohio Railroad in 1884. Consult Scharf's *History of Baltimore City and County* (Philadelphia, 1881).

GARRETT, THOMAS (1789-1871). An American merchant, distinguished as a philanthropist and reformer. He was born in Upper Darby, Pa., of Quaker parentage; learned the trade of a cutler and scythe-maker, and in 1820 removed to Wilmington, Del., where he became an iron and hardware merchant. Here, also, he avowed his anti-slavery opinions without reserve, and became widely known as the friend of the slaves and of negroes generally. His name was familiar to the slaves of Delaware, Maryland, and Virginia; and during a period of forty years there was a constant procession of fugitives seeking his protection and aid. It is said that not less than 3000 of them were indebted to him for their freedom. He was compelled to resort to many ingenious devices in his work, but he made no secret of the fact that he was engaged in it, and such was his reputation for success that few slaveholders thought it worth while to pursue their runaways any farther after learning that they had fallen into his hands. In 1848 he was prosecuted by James Bayard before Judge Taney (q.v.); was finally convicted on what appears to have been insufficient evidence of having abducted two slave children; and was fined so heavily as to render him penniless. His business would have been utterly broken up at this time if his fellow-citizens of Wilmington had not volunteered to furnish him all the capital he needed. At the time of his death he

was universally beloved by the whites as well as the blacks.

GARRICK, DAVID (1717-79). A celebrated English actor, long manager of Drury Lane Theatre, and the author of numerous comedies. Descended on his father's side from a family of Huguenot refugees named De la Garrique, he was born at Hereford, February 19, 1717, and educated at Lichfield, the home of his mother's family. During his youth he went to live with an uncle, who was a wine merchant in Lisbon, but he soon returned to England and became a pupil of the famous Dr. Johnson. A few months later, in 1736, master and pupil left Lichfield together in the hope of improving their fortunes in London. Garrick attempted the study of law; then for a time he engaged in the wine business; but the dramatic instincts which he had shown even as a schoolboy proved too strong, and after some amateur acting and falling in love with the famous Peg Woffington, he made, under an assumed name, his début on the stage at Ipswich (1741) in a play called *Oroonoko*. He succeeded so well that on October 19th of the same year he appeared in London in the character of Richard III. After being engaged for the following season at Drury Lane, Garrick went in the summer of 1742 to Dublin, where he excited the Hibernian enthusiasm to an extraordinary degree. His success in London, however, was not without unpleasant incident, for a quarrel arose between him and his friend Macklin, which was taken up by their partisans, and on one occasion Garrick's performance had to be given up. In 1747 he became one of the patentees of Drury Lane. Two years later he married Mlle. Violetti, an excellent *danseuse* from Vienna. This seems to have alienated some of his company, especially of the feminine members, who went over to the opposition house, and in 1750 occurred the famous rivalry, when Drury Lane and Covent Garden were each playing *Romeo and Juliet*, Garrick and Mrs. Bellamy at the former and Spranger Barry (q.v.) and Mrs. Cibber at the latter, till after a dozen nights the town was tired and Covent Garden gave up the field. In 1763 Garrick visited the Continent, and made the acquaintance of Diderot and other noted people. He conducted in 1769 the memorable jubilee at Stratford-on-Avon in honor of Shakespeare. To Garrick seems to belong much of the credit of bringing back to the stage Shakespeare's plays in their original form, in place of the altered versions which had commonly been in use since the Restoration. During his management also at Drury Lane he made an end of the old custom of admitting spectators upon the stage, and introduced other improvements. His own last appearance was on June 10, 1776, in *The Wonder*, when at the close of the play he made an affecting speech of farewell. His health was failing, and he died less than three years later, in London, January 20, 1779. He was buried beneath the Shakespeare monument in Westminster Abbey.

Garrick is regarded as the greatest of English actors. He exhibited a Shakespearean universality in the representation of character, and was equally at home in the highest flights of tragedy and the lowest depths of farce. But the naturalness which so distinguished him upon the stage

often forsook him in real life. He was extremely sensitive to ridicule, and had a curious fashion of forestalling the malice of the critics by bringing out, on occasion, pamphlets of bantering attack upon himself. In his financial affairs he was considered close, though his generousities were many. He left a fortune of about £100,000. He was on terms of intimate friendship with Johnson, Goldsmith, Burke, and other men of letters, and was a member with them of the famous "Literary Club." As an author he does not rank very high, though some of his farces, like *The Lying Valet* and *Bon Ton, or High Life Above Stairs*, have been repeatedly published, and his prologues were often extremely ingenious. A collected (partial) edition of his dramatic works was brought out in London in 1768 and again in 1798. Many of his letters are preserved in the Forster Collection at the South Kensington Museum. On his life consult: Knight (London, 1894); Fitzgerald (ib., 1868); Murphy (Dublin, 1801); Davies (London, 1780); "Mémoires de Garrick," in *Bibliothèque de mémoires relatifs à l'histoire de France pendant le XVIII. siècle*, vol. vi. Paris, 1878; and Boaden (ed.), *The Private Correspondence of David Garrick*, with a biographical memoir (London, 1832).

GARRICK CLUB. A famous club in London, named in honor of the great actor David Garrick. It was founded in 1831 for the promotion of letters, and especially of the drama, and in 1864 took up its present headquarters in Garrick Street. It possesses an important and valuable collection of portraits of celebrated English actors, which are shown to members' visitors on every Wednesday. Here occurred the controversy between Thackeray and Edmund Yates, which brought about the estrangement between the former and Dickens.

GARRISON, WENDELL PHILLIPS (1840-). An American editor and author, born at Cambridgeport, Mass. He graduated at Harvard in 1861, and was appointed literary editor of the *Nation*, of New York, in 1865. In addition to contributions to periodicals, he has published: *What Mr. Darwin Saw on His Voyage Around the World* (1879); with F. J. Garrison, a life of *William Lloyd Garrison* (4 vols., 1885-89); *Parables for School and Home* (1897); *The New Gulliver* (1898); and other works.

GARRISON, WILLIAM LLOYD (1805-79). The leader of the radical Abolitionists in the anti-slavery struggle in the United States. He was born at Newburyport, Mass., December 10, 1805. As an apprentice in the Newburyport *Herald* office (1818-25) he became an expert printer, and, while yet a boy, foreman, and contributor to that and other newspapers; and in 1826 was editor of the Newburyport *Free Press*. Soon afterwards, as a journeyman in Boston, he met and was deeply influenced by Benjamin Lundy (q.v.), a pioneer Abolitionist. After a year spent in editing the *National Philanthropist*, a Boston temperance paper, and the *Journal of the Times*, at Bennington, Vt., he joined Lundy at Baltimore, in September, 1829, in conducting the *Genius of Universal Emancipation*. The views of the two associates differed widely, for Lundy favored gradual abolition and colonization, which Garrison opposed. This phase of activity was short-lived, for editorials urging immediate emancipation presently repelled subscribers. The pub-

lic mind, however, long indifferent to the evils of slavery, began to be aroused, though the agitation found foes more readily than friends. In April, 1830, Garrison was convicted of libel. After seven weeks in jail his fine was paid by Arthur Tappan, of New York, and the reformer turned to lecturing in Northern cities with a vehemence and fire not previously brought to this task. From this time dates the birth of a public sentiment which was to make slow headway against difficulties and opposition, and finally to triumph through a civil war.

In January, 1831, appeared in Boston the *Liberator*, a small sheet, soon to be enlarged and conducted weekly by Garrison till the end of 1865. The first number gave its keynote: "I will be as harsh as truth, and as uncompromising as justice. On this subject I do not wish to think, or speak, or write with moderation." Such a tone compelled attention, and the editor was widely denounced as a 'wild enthusiast,' as a 'fanatic,' and as a 'public enemy.' Apathy gave place to excitement, in the North as well as in the South. Hundreds of letters threatened Garrison's life; in December, 1831, Georgia offered \$5000 for his arrest and prosecution, and on October 21, 1835, a mob, led or incited by reputable Bostonians, broke up one of his meetings, and dragged him through the streets until he was rescued with difficulty by the police, who placed him in jail to insure his safety. In January, 1832, Garrison, with eleven associates, founded the New England Anti-Slavery Society, the parent of similar organizations. In this year he published *Thoughts on African Colonization*, denouncing that futile scheme of the moderate opponents of slavery. In 1833 he went to England to confer with the British emancipators, and on his return supplied a platform for the American Anti-Slavery Society, founded in December of that year in Philadelphia. Of this he was president from 1843 to 1865. He was again in England in 1840 and 1846. Meanwhile the American Abolitionists divided. The moderate wing, which favored political action and objected to participation of women in their meetings, parted from their former comrades in 1840, and contributed to form the Liberty and Free-Soil parties. The extremists, who obtained or soon gained control of the societies, were more logical in disregarding the distinction of sex no less than that of color, and more 'thorough' in disowning a Government which acknowledged and protected 'the sin' of human bondage. In 1840 Garrison denounced the United States Constitution, to the horror of most, as "a covenant with death and an agreement with hell." He hailed the secession of South Carolina and the guns fired on Fort Sumter as the end of 'the pro-slavery Union.' Many wrought with him in urging the President to recognize the situation as it was. With the Proclamation of Emancipation their triumph came, and with the end of the war their leader's occupation was gone. With other eminent guests of the Government he saw the flag replaced over Sumter. No longer a lonely protagonist, his age was provided for in 1868 by a 'national testimonial,' through admirers of his altruistic labors, and his last years were spent in less arduous journalistic and reforming services, with honor at home and abroad. He died in New York, May 24, 1879. Of his *Sonnets and Other Poems* (1843), some had

been penciled on the walls of his Baltimore cell in 1830. Selections from his writings and speeches appeared in 1852. Consult: The exhaustive biography by his sons, W. P. and F. J. Garrison, *William Lloyd Garrison, 1805-79: the Story of His Life Told by His Children* (4 vols., New York, 1885-89), and an essay by Goldwin Smith, *The Moral Crusader, William Lloyd Garrison* (New York, 1892).

GARRISON COURTS MARTIAL. See COURTS, MILITARY.

GARBOD, gār'rod, Sir ALFRED BARING (1819—). An English physician, born at Ipswich. He studied at University College and the University of London; was appointed assistant physician at University College Hospital in 1847, and in 1851 physician, and professor of therapeutics and clinical medicine. In 1863 he was appointed physician, in 1874 consulting physician to King's College Hospital, and in the former year also became a professor in the college. He was elected in 1856 a fellow of the Royal College of Physicians, and its vice-president in 1888. In 1858 he became a fellow of the Royal Society of Great Britain, and in 1896 physician extraordinary to Queen Victoria. His researches have been connected principally with the pathology of gout and rheumatic gout, or rheumatoid arthritis, on whose nature and treatment he published in 1860 a valuable work. He introduced lithia as a remedy for gout. He wrote also *The Essentials of Materia Medica and Therapeutics* (1885; many subsequent editions), which became authoritative on the subject, and has been much used for text-book purposes.

GARBOD, ALFRED HENRY (1846-79). An English zoölogist. He was born in London, studied there at University and King's Colleges, in 1871 was elected prospector to the Zoölogical Society of London, and in 1873 a fellow of Saint John's, Cambridge. From 1874 until his death he was professor of comparative anatomy at King's College, London, in 1875 was appointed professor of physiology at the Royal Institution of Great Britain, and in 1876 was elected a fellow of the Royal Society. His zoölogical studies were of high value, in particular those connected with the anatomy of birds, in which department he was a recognized authority. His publications include an edition (1879) of a monograph by Johannes von Müller (q.v.), the physiologist of Berlin, on the vocal organs of passerine birds, and numerous papers collected and edited by W. H. Forbes (1881).

GARBOT. The golden-eye duck (see GOLDEN-EYE); a French name used in English books. Consult Newton, *Dictionary of Birds* (London, 1893).

GARROTE, gār-röt' (Sp., stick). A mode of execution practiced in Spain. Originally it consisted in simply placing a cord round the neck of a criminal, who was seated on a chair fixed to a post, and then twisting the cord by means of a stick inserted between the rope and the back of the neck till strangulation was produced. Later a brass collar was used, worked by a screw. To such condemned persons as recanted the Inquisitors granted as a favor this mode of strangulation before they were burned. If the executioner was unskillful, however, the pain was sometimes very great. Garroting is also the

name given to a species of robbery in which the highwaymen suddenly come behind their victim, and throwing a cord, or handkerchief, or something of the sort round his neck, produce temporary strangulation till their purpose is effected.

GAR'ROW HILLS. See GARO HILLS.

GARRUCCI, găr-rŭo'chê, RAFFAELE (1812-85). A Roman Catholic archæologist. He was born January 23, 1812, became a Jesuit 1826, and after de Rossi was the greatest explorer of the catacombs of Rome. He died at Rome May 5, 1885. Of his numerous writings the masterpiece is *Storia dell' arte cristiana nei primi otto secoli della chiesa* (1872-81).

GARRU'PA. A fish. See GROUPER.

GARSHIN, găr'shên, VSEVOLOD MIKHAILOVITCH (1855-88). A Russian author, born in the Government of Yekaterinoslav. On graduating from a Saint Petersburg gymnasium in 1874 he entered the School for Mining Engineers, but left it to enroll as a volunteer in the army sent to Turkey in 1877. He based his powerful story *Four Days* on an incident that occurred after the first skirmish. The story itself, and the Turgenieff-like mastery of detail and story-telling, all combined to produce a sensation. A series of stories of about twenty-five to fifty pages followed, each increasing his popularity and fame; but in 1880 the mental malady which had already attacked him broke out anew, and nearly two years was spent in sanitariums and out-of-the-way villages to recuperate. In 1883 Garshin again resumed his literary work, was appointed secretary to the Railroad Congress, and married a physician. His frail constitution needed all the care she bestowed on him, and his health improved, but in 1888, in a fit of insanity, he killed himself. In all his sketches there is a noticeable lack of the epic element; the outward description of his personages is utterly neglected in the exposition of the labyrinth of conflicting emotions and feelings. But as psychological studies, his sketches, mostly dealing with moral and social questions in the manner of Tolstoy, are the nearest approach to the latter's mastery. His works, in three volumes, were in the ninth edition in 1890. Most of them have been translated into German, French, and English.

GAR'STON. A town and port of Lancashire, England, on the Mersey estuary, five and a half miles southeast of Liverpool (Map: England, D 3). It has a large coal-shipping trade, its two docks belonging to the port of Liverpool. The town maintains parks, recreation grounds, isolation hospital, and has planned a series of modern improvements in electric lighting, public offices, technical schools, and free library. Population, in 1891, 13,400; in 1901, 17,300.

GARTER, ORDER OF THE. The highest Order of chivalry in Great Britain. The Order of the Garter was instituted by King Edward III., and though not the most ancient is one of the most famous of the chivalrous orders of Europe. The original number of the Knights of the Garter was twenty-five, the Sovereign himself making the twenty-sixth. The story goes that the Countess of Salisbury let fall her garter while dancing with the King, and that the King stooped quickly to pick it up. This occasioned some indelicate jokes which caused the Countess to withdraw. The King exclaimed angrily, *Honi soit qui mal*

y pense, "Shame to him who evil thinks," and added that he would make this blue ribbon so glorious that all the courtiers would desire it. This story has absolutely no foundation in fact. Edward had formed the plan for the Order in 1344 and instituted it on April 23, 1349. It was founded in honor of the Holy Trinity, the Virgin Mary, Saint Edward the Confessor, and Saint George; but the last, who had become the tutelary saint of England, was considered its special patron, and for this reason it has borne the title of 'The Order of Saint George' as well as of 'The Garter.' A list of the original knights or knights founders is given by Sir Harris Nicolas. The Order was reorganized in 1831, when the number of knight companions was left at twenty-five, but the membership extended to include the Prince of Wales, and such descendants of George I. and foreign sovereigns as might be chosen. The emblem of the Order is a dark blue ribbon edged with gold, bearing the motto, *Honi soit qui mal y pense*, in gold letters. It is worn on the left leg below the knee. The Grand Master is always the monarch of England. The number in the Order is at present about fifty. The officers are the prelate (the Bishop of Winchester), the chancellor (the Bishop of Oxford), the registrar (the Dean of Windsor), the Garter King-of-Arms (q.v.), and the Gentleman Usher of the Black Rod. Consult Nicolas, *History of British Orders of Knighthood* (London, 1841-42). See ORDERS.

GARTER KING-OF-ARMS. An officer of the Order of the Garter and the chief heraldic authority in England. The office was instituted by Henry V., with the advice and consent of the knight companions. The duties of the Garter are to attend upon the knights at their solemnities; to inform those chosen to the Order of their election, and to summon them to the installation; to marshal funeral processions; to assign lords to their places in Parliament; and to be the executive officer of the King for the Order. The Garter is also the principal king-of-arms, taking precedence over the other three kings-of-arms in England. He is a member of the 'Heralds' College,' or 'College of Arms,' of which the Earl Marshal is the head. The Garter grants and confirms arms under the authority of the Earl Marshal, but as Garter King-of-Arms he is independent of him. See HERALDS' COLLEGE.

GARTER-SNAKE (so-called from its color-stripes). An elastic name given in North America to any of various small snakes, but properly applied to striped species of the genus *Eutania*, which includes those most often seen of all our serpents. The genus is widespread, and contains, according to Cope, twenty-four species north of the Isthmus of Panama. Several of these are very slender, mainly green with lighter stripes, and are popularly distinguished as ribbon-snakes (q.v.). One Oregon species is black, and some semi-tropical species have the stripes broken so as to form series of spots or cross-bars. The best-known species is the ordinary garter-snake (*Eutania sirtalis*), which is distributed over the whole United States, Southern Canada, and the lowlands of Mexico and Guatemala. Throughout this large area it presents a wide series of variations which have been distinguished by Cope, *Annual Report of the United States Na-*

tional Museum (Washington, 1898), as eleven sub-species, but his distinctions are difficult to follow.

The length of the garter-snake when fairly grown is about three feet, of which from one-fourth to one-fifth belongs to the tail. As a species it is the most widely distributed and most numerous in individuals of any of our serpents, except in the Western arid regions. This is due to its extreme fecundity, to its agility and ingenuity in pursuit of food or in escape from danger, and to its willingness to fight off assailants. It is to be found in all sorts of situations, but is partial to grassy meadows and to the borders of streams, where the frogs, toads, fish, mice, and shrews upon which it mainly feeds are numerous; and it takes to water willingly and swims well. Some other species of the genus are almost habitually water-snakes. All garter-snakes are able to climb well, wriggling easily up a rough tree-trunk, a wall of brick, or of rough boards, and they search the bushes for eggs and young birds in the spring, but rarely climb high. They are bold in coming about gardens and village streets, but enter cellars, dairies, and chicken-houses less often than do some larger serpents, such as the milk-snake. All garter-snakes retain the eggs in the oviduct of the mother until they hatch and the embryos have reached a length of $5\frac{1}{2}$ to 7 inches, when they are extruded, from 25 to 75 being produced (late in summer) by a single female; but when so many are born some will be small or even confined within the egg-covering when pressed from the vent. These young are able at once to take care of themselves, and will struggle vigorously for earth-worms, etc. They remain together, and are watched and protected by the mother, who will brave formidable perils in her anxiety for their welfare. It has been asserted repeatedly by credible witnesses that she receives them into her mouth and throat for temporary refuge from danger, whence they emerge as soon as possible. The courage and pugnacity of this snake are familiar facts; it is the only one of our common snakes that will ever come toward a man with threatening demeanor when attacked. Its bite is quite harmless so far as poison is concerned, but its strength and weasel-like courage make it a successful antagonist of many animals whose size would seem to give them immunity. It is itself, however, the favorite prey of the blacksnake, copperhead, and of many reptile-hunting birds and mammals. On the approach of cold weather these snakes seek some opening in the ground, creep as far in as practicable, and become dormant, emerging, however, rather earlier in the spring than most other serpents. In the West the burrows of ground-squirrels, badgers, etc., are favorite hibernacula; and in these retreats great numbers of the snakes often gather and entangle themselves into a ball of sleeping serpents—a practice induced, probably, by sexual impulses, as well as by a desire for mutual comfort.

In addition to the common and variable garter-snake (*Eutania sirtalis*) there occurs numerously in the Eastern United States the ribbon-snake (q.v.). Florida has a local species (*Eutania Sackeni*); and the Mississippi Valley and plains region possess a local species (*Eutania redix*), which is peculiar in its fondness for water and a fish diet. In the central region and

on the Pacific Coast is found another species (*Eutania elegans*), which exhibits many variations of color, and has habits similar to the Eastern form. Finally, many species belong to Mexico and Central America. See SNAKE.

GARTH, CALEB. A character in George Eliot's novel *Middlemarch*, a man of great physical strength and distinguished for his integrity and shrewdness, probably drawn from Robert Evans, the author's father.

GARTH, Sir SAMUEL (1661-1719). An English physician and poet. He was born at Bowland Forest, Yorkshire, in 1661, was educated at Peterhouse, Cambridge, and studied medicine at Leyden. Obtaining the degree of M.D. from Cambridge in 1691, he settled in London, where he was elected a fellow of the College of Physicians (1693), and was soon recognized as a wit and conversationalist. He was knighted in 1714, and appointed physician-in-ordinary to George I. and physician-general to the army. He died January 18, 1719. Garth gained deserved fame in his own time for a satirical poem entitled "The Dispensary" (1699), in which he ridiculed those physicians who opposed his plan for establishing a free dispensary for poor people. He also published "Claremont" (1715), a descriptive poem in imitation of Denham's "Cooper's Hill," and two years later contributed to a translation of Ovid's *Metamorphoses*. He was much admired by Pope and others. His verse is smooth but monotonous. Consult the sketch of Garth in Johnson's *Lives of the Poets* (London, 1854), and Chalmers, *Works of the English Poets*, vol. ix. (London, 1810).

GÄRTNER, gërt'nër, FRIEDRICH (1824--). A German architectural painter, born in Munich, the son of the architect Friedrich von Gärtner, with whom he went to Athens in 1840. After his return he studied at the Academy and under Simonsen, of Copenhagen, then in Paris (1846) under Claude Jacquand; visited Spain and Morocco in 1848, lived again in Paris, in 1851-57, and settled in Munich, where two of his paintings, "Interior of a Moorish House" and "Court of a Monastery by Moonlight" (1846), are in the New Pinakothek.

GÄRTNER, gërt'nër, FRIEDRICH VON (1792-1847). A distinguished German architect, born at Coblenz. His father, also an architect, removed in 1804 to Munich, where young Gärtner received his first education in architecture. To complete that education, he went in 1812 to Paris, where he studied under Percier, and in 1814 to Italy, where he spent four years in the earnest study of antiquities. The fruits of this labor appeared in 1819 in some views accompanied by descriptions of the principal monuments of Sicily (*Ansichten der am meisten erhaltenen Monumente Siciliens*). After a visit to England he was called, in 1820, to the chair of architecture in the Academy of Munich. With this appointment began his work as a practical architect. Many of the architectural masterpieces of Munich, and various other buildings throughout Germany, as well as the new royal palace at Athens (1836), are built after his plans. Among his Munich buildings are the Ludwigskirche, the Feldherrn-Halle, the Library, University, and the Wittelsbacher Palace (1831-44). In the style of his works, which have all a common impress, Gärtner represents the Renaissance

of mediæval architecture in its Romanesque form. It was thus peculiarly appropriate that he should have charge of the restoration of the mediæval cathedrals of Speier, Regensburg, and Bamberg. Gärtner became head Government surveyor of buildings and director of the Academy of Arts in Munich.

GÄRTNER, HEINRICH (1828—). A German landscape painter, born at Neustrelitz. He was a pupil of F. W. Schirmer in Berlin, and of Ludwig Richter in Dresden, whence he went to Rome to study the old masters, and there was also much influenced by Cornelius. He became favorably known after his return to Germany, through several decorative cycles, executed in private houses and villas, and was commissioned to paint some of the mural decorations in the new Court Theatre at Dresden, and after that the encaustic paintings in the Hall of Sculptures in the Leipzig Museum (1879). Three great landscape compositions by him (1883-85) adorn the staircase of the Agricultural Museum in Berlin. Of his oil paintings there is a "Landscape with the Return of the Prodigal Son" in the Leipzig Museum, and one with "Adam, Eve, Cain, and Abel" in the Dresden Gallery.

GÄRTNER, JOSEPH (1732-91). A German botanist. He was born at Kalw (Württemberg), studied at Tübingen and Göttingen, and after extensive travel was, in 1761, appointed professor of anatomy at the former university. From 1768 to 1770 he was professor of natural history and director of the botanical garden and the natural history collection at the University of Saint Petersburg. His most important work is *De Fructibus et Seminibus Plantarum* (1788-91), which, by its minutely accurate descriptions, comprising a thousand and more species, introduced a new era in plant morphology. The scientific value of the book was much increased by the addition of 180 copper-plate engravings.

GARTSHER/IE. A former village in Lanarkshire, Scotland, on the Caledonian Railway, two and one-half miles west-northwest of Airdrie (Map: Scotland, D 4). In 1871 it had 2000 inhabitants. The establishment of extensive iron-works, noted for the quality of their product, developed a prosperous town, which was incorporated with Coatbridge (q.v.) in 1885.

GARVE, gār've, CHRISTIAN (1742-98). A German philosopher. He was born at Breslau, studied at the universities of Frankfurt-on-the-Oder and Halle, in 1769 succeeded Gellert as professor of philosophy at Leipzig, but in 1772 was obliged by ill health to retire. His writings did much toward the popularization of philosophy in Germany. His work was highly valued by Kant, and by Frederick II., who bestowed upon him a pension of 200 thalers and requested him to prepare a translation (1783; 6th ed. 1819) of Cicero's *De Officiis*. Garve eulogized the King in the *Fragmente zur Schilderung des Geistes, Charakters und der Regierung Friedrichs II.* (1798). Among his further publications are a collection of essays, *Ueber verschiedene Gegenstände aus der Moral, der Litteratur und dem gesellschaftlichen Leben* (1792-1802), and translations (1798-1801, 1799-1802) of the *Ἠθικά* and *Πολιτικά* of Aristotle.

GAS. See GASES, GENERAL PROPERTIES OF.

GAS (popularly supposed to have been invented by the Belgian chemist Helmont, influenced by Dutch *gest*, spirit, but according to his own statement derived by him from Gk. *χᾶος*, *chaos*, chaos, the Dutch *g* being pronounced much like the Gk. *χ. ch*), ILLUMINATING. A term applied to any mixture of combustible gases that may be used as an illuminant. The raw materials which have been employed for making such gas include a variety of substances rich in carbon and hydrogen, such as bituminous coal, wood, resin, oils and fats, and petroleum. When subjected to destructive distillation these substances yield water, tar, gas, and a residue of coke or charcoal. The principal sources of illuminating gas are, however, bituminous coal and petroleum. Cannel coal is used to a certain extent as an enricher or means of increasing the illuminating value, but has been largely superseded for this purpose by petroleum. As commercially supplied, illuminating gas is of two kinds, coal-gas and carbureted water-gas.

COAL-GAS.

Coal-gas is the gas produced by the destructive distillation of bituminous coal.

HISTORY. The existence of inflammable gases issuing from the earth has been known from very early times. In 1659 Thomas Shirley communicated to the Royal Society a paper describing experiments on a gas issuing from a well near Wigan in Lancashire, and resulting in his opinion from the decomposition of coal. Dr. John Clayton, in a paper presented to the same society, in 1739, described the production of a similar gas from coal heated in a closed vessel. It was not, however, until 1792 that the practical value of coal-gas as an illuminant was demonstrated by William Murdock, a Scotchman, who constructed apparatus by which he lighted his home and office in Redruth, Cornwall. In 1798 he moved to Soho, and introduced the illuminant in the Soho foundry. The experiment proved highly successful, and the plant was soon enlarged so as to give light to the principal shops in the vicinity. In 1805 Murdock introduced gas in the cotton-mills in Manchester. Meanwhile, Lebon had used coal-gas in his home in Paris in 1799, and his experiments attracted the attention of Winsor, the 'father of modern gas lighting,' who, on his return to England soon after, urged the use of coal-gas for general illumination. In consequence of his agitation, various buildings in London were lighted by this means, but it was not until 1810 that he secured the incorporation of the Gas Light and Coke Company, and even then the Royal charter was not granted until 1812. Westminster Bridge in London was first lighted by gas in 1813, and in 1815 Guildhall was similarly illuminated. As a street illuminant, gas was first introduced in Saint Margaret's parish in London. Paris was lighted in 1820, and thereafter the use of gas for street illumination was gradually extended throughout the Continent. In the United States the use of illuminating gas was agitated as early as 1812; it was successfully introduced in Baltimore in 1821, in Boston in 1822, in New York gradually between 1823 and 1827.

THE COAL. A good gas-coal should contain only a small percentage of ash and sulphur, and should yield, upon distillation, a comparatively large percentage of volatile matter of good illu-

minating value, and a good coke amounting to from 55 per cent. to 65 per cent. of the original weight of the coal. A gas-coal showing the following analysis by weight may be considered as the standard for the United States: Volatile matter, 33 per cent. to 35 per cent.; fixed carbon, 55 per cent. to 60 per cent.; ash, 4 per cent.

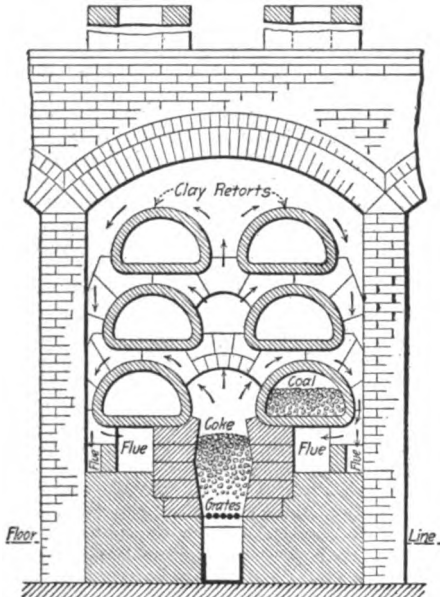


FIG. 1. COAL-GAS RETORT, WITH DIRECT-FIRE FURNACE.

to 6 per cent.; sulphur, 0.4 per cent. to 0.6 per cent. A pound of such coal will yield, upon distillation, about five cubic feet of gas, possessing an illuminating value of from 15 to 17 candle power when burned in an Argand burner.

Under proper conditions, a falling off in any direction may compensate for a proportionate betterment in another. Thus an extra amount of sulphur may be offset by an increased yield of gas, or a harder, better coke. Comparative cheapness of price may also turn the scale in favor of an otherwise inferior local coal. Good gas-coals of practically the above composition are found in Pennsylvania, in the Pittsburg fields; in West Virginia, in the West Virginia and Kanawha fields; and also in Tennessee, Indian Territory, and Colorado; while others not so good are found in Alabama, Kansas, and Washington. In Europe the coal-fields of England furnish the best gas-coals, these English coals being of very nearly the composition given above, except that they contain less ash, but more sulphur.

APPARATUS. The distillation of the coal is carried on in closed retorts, heated by suitable furnaces. Originally made of cast-iron and circular in cross-section, these retorts are now made of fire-clay and are oval or D-shaped. They

are of varying dimensions, a very common size for the United States being 16 in. \times 26 in. \times 9 ft. inside, and are set in groups of from three to nine, there being usually six in a group. The

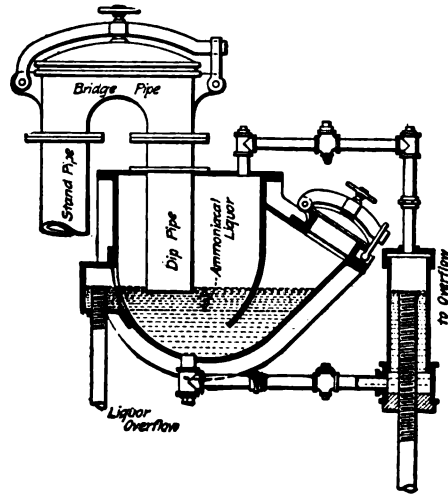


FIG. 2. CROSS-SECTION OF HYDRAULIC MAIN.

furnaces by which these groups are heated are of two kinds—direct fire and generator. In the former the carbon of the fuel is burned directly to carbonic acid, while in the latter the combustion of the carbon is performed in two stages, the first taking place in the furnace proper and forming carbonic oxide, which is burned in the second stage to carbonic acid, this secondary combustion taking place between the retorts. The use of generator furnaces results in greater economy of fuel and the attaining of a higher temperature in the retorts than is possible with

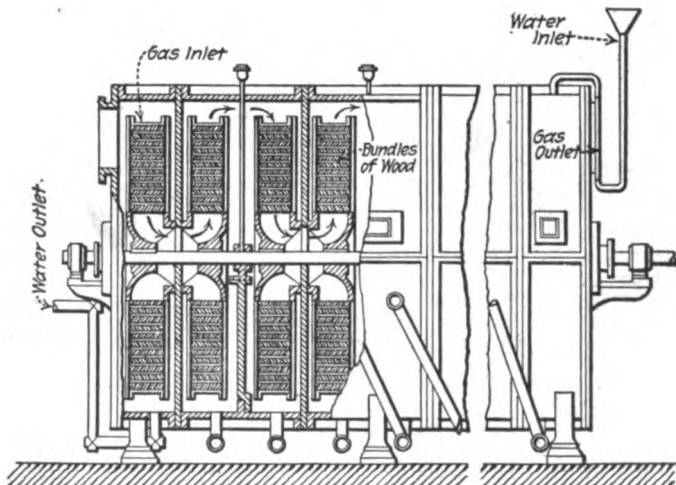


FIG. 3. SECTION AND ELEVATION OF ROTARY GAS SCRUBBER.

direct-fire furnaces, both of which advantages are secured to a still greater degree by the use of recuperators, in which the heat of the outgoing products of combustion is transferred to the incoming air. The retorts are either set horizontally, or, as has been done to a great

extent in Europe during the last few years, at an angle of from 29° to 32° to the horizontal. The object of this inclination is to permit the charging of the coal into, and the discharging of the coke from, the retorts to be performed by gravity instead of by manual labor or by machinery, as is necessary when they are set horizontally. The comparative merits and economy of inclined retorts and horizontal retorts charged and drawn by machinery is a matter that is being actively discussed by gas engineers in all countries. In large gas-works coal and coke handling machinery is employed, sometimes to such an extent that the coal is unloaded from the cars or vessels in which it is brought to the gas-works, transported to the retort-house, and charged into the retorts, and the coke drawn, carried to the yard, and stacked or loaded for sale without being touched by hand. Retorts of the size mentioned will take charges of from 250 to 350 pounds of coal, according to the degree to which they are heated.

To the open end of each of the retorts is bolted a cast-iron mouthpiece, of the same cross-section as the retort, and from 14 to 16 inches long. On the outer end of the mouthpiece is hinged, so that it can be readily opened and closed, a cast-iron or steel lid, which, when closed, makes a gas-tight joint with the face of the mouthpiece. On the side of the mouthpiece a bell is provided, into which is inserted the lower end of the standpipe, or pipe through which the gas passes away from the retort. On the top of the standpipe is a bridge or arch pipe, from which hangs a dip-pipe, which is bolted to the hydraulic main (a large pipe generally U-shaped, and made of steel), and passing down into this main dips below the surface of the ammoniacal liquor, with which the hydraulic main is partly filled, and by being thus sealed prevents the return of any gas to the retort when it is open for drawing and charging.

From the hydraulic main the gas passes to the exhauster, a rotary pump driven by a steam-engine, employed to relieve the retorts of the pressure thrown by the weight of the gas-holders and the friction encountered by the gas as it passes through the apparatus. It then goes into a tar-extractor, in which the gas is subjected to friction and impact for the removal of such of the heavy tar as has not been condensed out in the hydraulic main. After the removal of the tar, which should be effected at a temperature not lower than 100° F., the gas is cooled in the condensers to a temperature of about 50° to 60° F. These condensers may be either atmospheric condensers or water-condensers. The atmospheric condensers employ air, and have concentric steel shells forming an annular gas space exposed to air on both the inner and outer circumferences. They are used to perform the first part of the cooling, which is completed by the water-condensers, these being somewhat similar in construction to a tubular boiler, the water passing through the tubes in one direction, while the gas passes outside of them in the opposite direction.

Having been cooled, the gas passes to the washers and scrubbers for the removal of the ammonia gas which it still contains. In the washer the gas is caused to bubble through water, while in the scrubber it is caused to

pass in thin streams over wetted surfaces, the object in each case being to expose the gas to intimate contact with water. Scrubbers are of two general types—tower scrubbers, vertical steel cylinders filled with bundles of thin boards which are wet by water caused to flow over them by the force of gravity, and rotary scrubbers, fitted with bundles of wooden rods mounted on a horizontal shaft and kept wet by being rotated through the water or ammoniacal liquor, with which the lower part of the scrubber is kept filled.

From the scrubber the gas passes to the purifiers. These are usually four in number, and the gas passes through three of them consecutively, while the fourth is cut out for cleaning and refilling. They are cast-iron boxes with open tops, which are closed by means of removable covers made of light steel plates. When in place over the boxes the sides of these covers are sealed in water contained in 'cups' cast on the sides of the boxes, and the escape of gas is thus prevented. The purifiers are filled with one or more layers of slaked lime or oxide of iron, the latter being the most commonly used in the United States.

From the purifiers the gas passes to the station meter, where it is measured by means of a drum divided into either three or four compartments. The meter is partly filled with water and the inlets and outlets to the different compartments are so arranged in connection with this water that gas cannot simultaneously enter and leave a compartment. The pressure of the gas causes the drum, which is mounted on a shaft, to revolve so that each compartment is alternately filled and emptied; and since each is filled with a definite volume of gas, the volume of gas passing through the meter is accurately measured, and is recorded by suitable mechanism.

After passing through the station meter the gas is conveyed to the gas-holder, a cylindrical vessel open at the bottom, but closed on top, made of steel sheets. The lower edge of the gas-holder is always kept sealed in water contained in a masonry or steel tank, in which the holder is free to rise and fall, being so guided in the tank and along columns rising above the tank as to move freely up and down while being prevented from tilting. The guiding is performed by rollers or wheels attached at equal distances around the top and bottom of the cylinder, and in the case of telescopic holders at the top and bottom of each of the sections, working against rails or channel irons fastened to the inside of the tank wall and of the columns. All large gas-holders are telescopic, that is, are made with one or more outer sections, which are merely rings, in addition to the inner section closed on top. At the bottom of each of the sections, except the outermost, is a 'cup,' an annular trough having its inner side formed by the bottom course of the section, its bottom by a channel iron, and its outer side by a course of sheets riveted to the outer edge of the channel iron. At the top of each of the outer sections is fastened a 'grip,' which is a cup turned upside down. Gas is admitted to and drawn from the holder by pipes passing down on the outside of the tank under and through its foundation, and up on the inside to a point above the water-

level. When gas is admitted it enters the space between the closed top, or crown, and the water in the tank. As it continues to enter, the pressure increases until it is sufficient to overcome the weight of the holder, which then begins to rise and continues to do so as long as gas is entering faster than it is passing out. When the inner section is completely filled with gas the cup filled with water engages the grip of the next section, and as gas continues to flow into the holder, raises this section, the water in the cup forming a seal which prevents the escape of any gas. When the holder descends the outer section lands on the bottom of the tank, and the inner section continuing to go down, the cup and grip separate. The columns, by which the holder is guided and prevented from tilting as it rises above the tank, are built up of structural steel and are connected together at the top and intermediate points by girders, and also by diagonal ties, so that the whole of the guide framing is bound together into what is practically a rigid cylinder. Originally built in very small sizes, and with only a single lift, gas-holders have been made larger and with more lifts, until the largest holder yet built, one at the East Greenwich Works in London, consists of six lifts, and contains, when full, 12,000,000 cubic feet of gas. The largest holders built in the United States have five lifts and a capacity of 5,000,000 cubic feet. In the case of one of these holders, the upper lift, and in the case of the 12,000,000 cubic feet holder, mentioned above, the two upper lifts are allowed to

the ends of each rope being attached to the holder at two points diametrically opposite each other, one at the top and the other at the bottom of the same section, passing over pulleys in such a way that as the holder rises and falls the rope is taken up at one end and paid out at the other at an equal rate, so that the two points to which it is attached are forced to travel along vertical lines.

PROCESS OF MANUFACTURE. When the coal is placed in the retort the volatile matter is driven off by the exposure to heat, rapidly at first and then more and more slowly. The reactions taking place in the retorts are complex and not perfectly understood; but in general they consist of the decomposition of the coal into coke and heavy hydrocarbons, and the breaking down of the latter into lighter hydrocarbons, with the setting free of hydrogen and marsh gas; and when the breaking down is carried too far, of solid carbon, which is deposited on the interior of the retort. Reactions also occur between some of the nitrogen and hydrogen, the hydrogen and sulphur, and the carbon and nitrogen by which comparatively small amounts of ammonia, sulphureted hydrogen, and cyanogen are formed. The coke which is left in the retort is composed almost entirely of uncombined carbon, with a percentage of ash dependent upon the amount of ash in the coal. The extent to which the hydrocarbons are broken down increases with the temperature at which the retorts are maintained, and therefore the volume of the gas produced increases, and its illuminating value de-

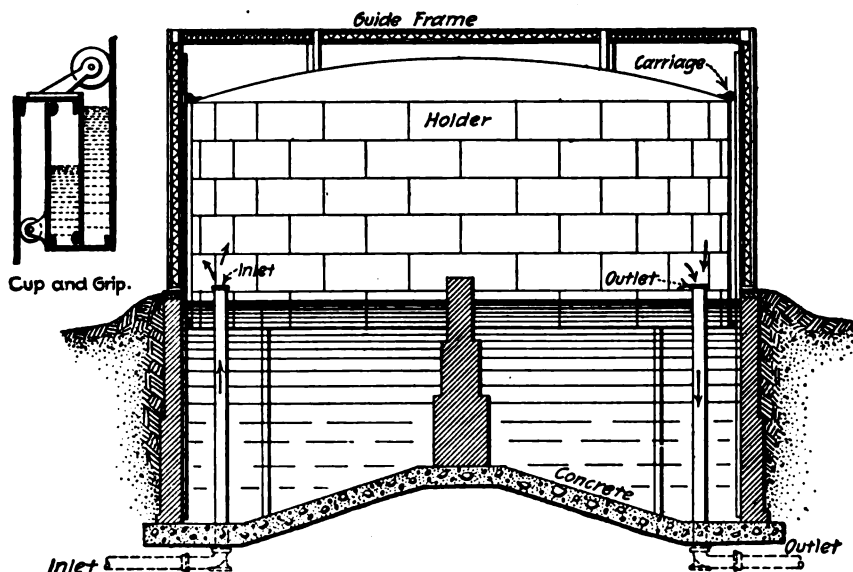


FIG. 4. SECTION THROUGH GAS-HOLDER.

rise above the guide framing, their stability being maintained by the weight of the lower lifts which they carry. In some cases, usually those of comparatively small holders, the guide framing has been completely done away with, the guiding being performed either by means of spiral guides fastened to the inside of the tank wall, and to the inner surfaces of the sections of the holder, or by means of wire ropes,

creases, with each increase in the temperature of the retorts. The product of illuminating value and quantity is, however, up to a certain point, greater with high than with low heats, and the retorts are usually heated to a temperature of from 2000° to 2300° F. The gas produced is deteriorated in illuminating value if exposed to prolonged contact with the hot walls of the retort, and to reduce the extent of this contact to

a minimum the volume of the charge of coal should be as large as possible in proportion to the size of the retort. The existence of a pressure in the retort also increases the contact between the gas and the walls, and it is to avoid this, as well as leakage of gas through minute cracks in the clay, that the pressure is taken off the retort by means of the exhauster. In the United States the length of charge or time the coal is left in the retorts is usually four hours, the heat and the weight of charge being so proportioned that the gas is all driven off in this time. In England the length of charge is usually five to six hours.

The gas leaving the retort is a mixture of permanent gases, principally hydrogen, marsh gas, and carbonic oxide, with some carbonic acid, nitrogen, sulphureted hydrogen, ammonia and cyanogen, hydrocarbon vapors that can be retained in the gas by proper treatment and are the most important light-giving constituents, and hydrocarbon vapors that cannot be retained in the gas when it is reduced to ordinary temperatures. The problem to be solved in the cooling of the gas, which begins as soon as it enters the standpipe, is the removal of these heavy vapors in such a manner as to leave in the gas a sufficient quantity of the lighter vapors to saturate it fully at the minimum temperature and maximum pressure to which it is to be subjected in the future. After the gas has been cooled it is necessary to remove the ammonia and sulphureted hydrogen, and in some cases the carbonic acid and cyanogen are also taken out.

The heaviest of the vapors condense in the hydraulic main, forming tar, which must not be allowed to rise to the level of the lower edges of the dip-pipes, since if brought into intimate contact with the gas it will absorb the lighter hydrocarbon vapors. For this reason it is also necessary that the heavy tar that is not deposited in the hydraulic main should be removed from the gas before it is cooled, and this is done by the friction tar-extractor. The lighter tar is then condensed out by the cooling effected in the condensers. This cooling should be done very gradually to avoid the condensation of vapors that should be retained in the gas. As the gas cools, some of the water-vapor, with which it is saturated, condenses and absorbs a portion of the ammonia, forming ammoniacal liquor. The tar and ammoniacal liquor thus formed in the hydraulic main and the condensers are run off through suitable drains into wells. The portion of the ammonia that still remains in the gas when it leaves the condensers is removed in the washer and scrubber. By using weak ammoniacal liquor as the washing liquid in the first stages of the scrubbing, the ammonia is made to combine with carbonic acid and sulphureted hydrogen, the resulting liquor being an aqueous solution of carbonate, sulphide, and various other salts of ammonia.

The gas leaving the scrubbers contains as impurities carbonic acid and sulphureted hydrogen, as well as small quantities of other sulphur compounds and cyanogen. It is necessary to remove the sulphureted hydrogen and reduce the sulphur compounds to an amount not to exceed 25 grains per 100 cubic feet of gas, since these substances produce sulphurous oxide when burned, and thus give rise to disagreeable fumes

if present in any quantity. The carbonic acid is sometimes removed also, although, being harmless except as it affects the illuminating value, it is usual in the United States to allow it to remain in the gas. For its removal it is necessary to employ, in the purifiers, hydrate of lime, which combines with it, forming carbonate of lime. Lime will also combine with sulphureted hydrogen, and was formerly the sole substance employed for its removal, which can, however, be effected much more economically by the use of hydrated sesquioxide of iron, either prepared artificially, or in the shape of a natural bog ore; and this has largely superseded lime. The reaction between the oxide of iron and the sulphureted hydrogen results in the formation of sulphide of iron, which is again changed to oxide when the fouled material is exposed to the air. The material can thus be used over and over again until it becomes so charged with the sulphur, deposited at each revivification, as to be rendered inactive. The oxide of iron also absorbs some of the cyanogen, and when spent is of value for the manufacture of cyanides and of sulphuric acid. After passing the purifiers the gas is ready for distribution, being measured solely for the convenience of the manufacturer; but, as the demand is not uniform from hour to hour, and it is necessary that the rate of production should be practically so, the gas-holders are provided to store the excess quantity made during the time of small demand for use at the time of large demand.

The scheme of condensation and purification outlined is that usually employed in the United States. In Europe it is becoming customary to scrub the gas with a solution of an iron salt to remove the cyanogen more completely and in a more merchantable form than is done in the purifiers, and also with tar oils to remove naphthalene, a hydrocarbon vapor, which, when the gas is chilled, condenses at once to the solid form in light flakes, and at times causes much trouble by stopping the small pipes of the distribution system. When the naphthalene is not removed it is necessary to add to the gas, if trouble is experienced, a hydrocarbon vapor that will condense, at the same time that the naphthalene crystallizes, to a liquid capable of dissolving the crystals, and so prevent them from forming obstructions in the pipes.

It will be seen that in addition to the gas there are produced in the manufacture of coal-gas coke, tar, and ammoniacal liquor, all of which are valuable, the coke as a fuel, the tar as a raw material for the manufacture of paving and roofing pitch, artificial dye-stuffs, various drugs, etc. (see COAL-TAR), and the ammoniacal liquor as a raw material for the manufacture of ammonia in various forms. The products from 100 pounds of gas coal will be, about, 65 pounds of coke, 500 cubic feet of gas, .6 gallon of tar, and 1.3 to 1.5 gallons of ammoniacal liquor containing .23 to .32 pound of pure ammonia.

CARRURETED WATER-GAS.

Carbureted water-gas is produced by mixing with non-luminous water-gas sufficient oil-gas, obtained from petroleum, to give the required illuminating power. It is made by decomposing steam in the presence of incandescent carbon so that the hydrogen is set free, and the oxygen unites with the carbon giving carbonic oxide.

These two gases, with small amounts of methane, carbon dioxide, and nitrogen, form water-gas, which, while combustible, does not burn with a luminous flame until enriched with oil-gas, made in a separate operation, or, as is more common, the mixture takes place as the oil-gas is made.

HISTORY. Although it was shown by Fontana, in 1780, that a combustible gas could be formed by the reaction between steam and incandescent carbon at high temperatures, which is the basis of all water-gas manufacture, and between 1823 and 1858 many patents were taken out aiming to take advantage of this reaction, the commercial development of the manufacture of water-gas and carbureted water-gas is of comparatively recent date. This development was made almost entirely in the United States, where both anthracite coal, a desirable source of carbon, and petroleum, for the manufacture of oil-gas, were plentiful and cheap. In the earlier forms of apparatus the water-gas was made from coal raised to incandescence in externally heated retorts, similar to coal-gas retorts, and the amount of fuel required proved too great for the success of the process. In 1871 Tessie du Motay erected in New York an apparatus for the manufacture of 'oxygen' gas, which, although it proved unsuccessful, was later developed into the generator-retort form of carbureted water-gas apparatus, and in 1873 Lowe erected, in Phoenixville, Pa., the first apparatus of the generator-superheater type, covered by his patent taken out in 1872. In 1875 Lowe took out, as a result of his experience in construction, another patent, the basic patent for apparatus of this class.

When the proper temperature is reached, the blast is shut off, the outlet for the escape of the products of combustion closed, and steam is admitted to the fire, forming water-gas. The water-gas is led from the generator into a small gas-holder, called a relief holder. This is necessary, as the action of the generator is intermittent, because the production of water-gas rapidly cools the fire below the gas-making temperature, to which it must be brought back by again putting on the blast, while the gas must pass through the rest of the apparatus continuously and at a uniform rate. From the holder it is led above a series of steam-heated shelves, on which naphtha is vaporized, and the mixture of gas and vapor then passes through externally heated retorts, the vapor being converted by the heat into

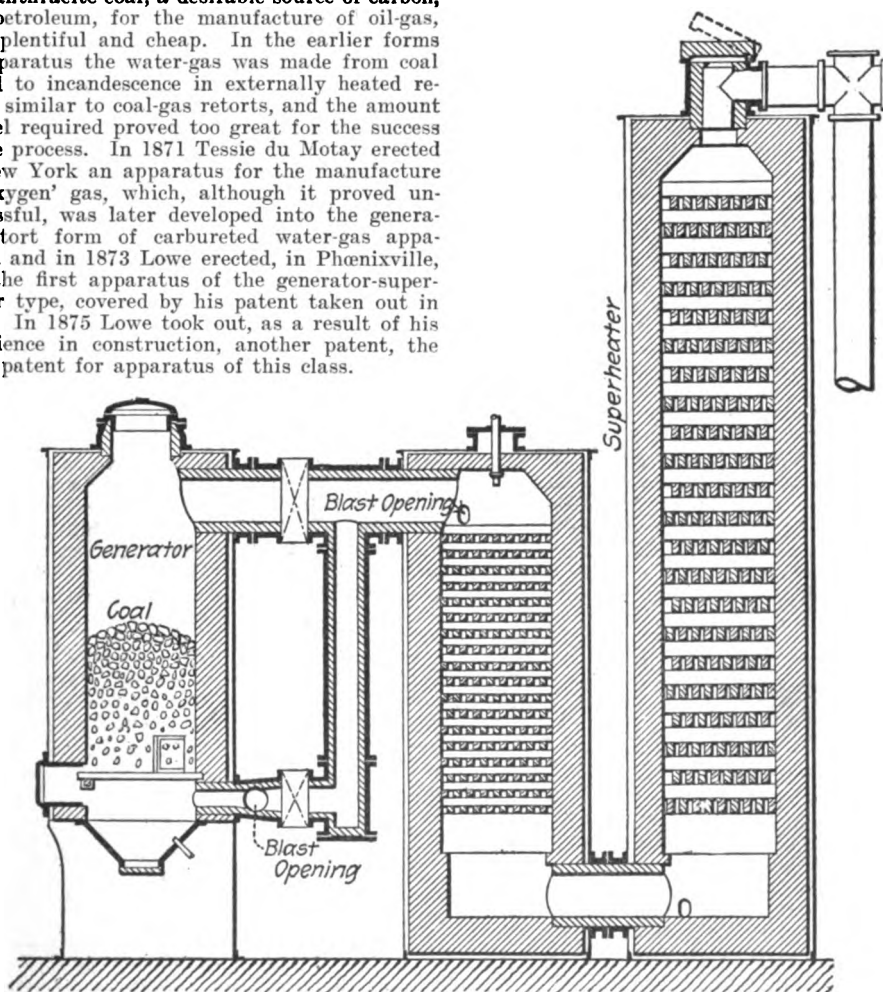


FIG. 5. DOUBLE SUPERHEATER LOWE CARBURETED-GAS APPARATUS.

APPARATUS AND PROCESS OF MANUFACTURE. In the generator-retort type of apparatus the water-gas is made in a generator, a steel shell lined with fire-brick, which after a fire has been kindled in it is filled with coal that is brought to incandescence by means of a forced blast of air.

a permanent gas. The crude carbureted water-gas so formed is drawn from the retorts by an exhauster and condensed and purified, without being scrubbed, in the manner described under the heading *Coal-Gas*.

In the generator-superheater type of appa-

ratus the water-gas is made and carbureted in one operation. In its most common form it consists of three brick-lined steel cylindrical vessels connected together and called the generator, the carbureter, and the superheater. The generator contains the coal, and the carbureter and superheater are filled with fire-brick piled in a checker-work. This checker brick is heated by the combustion of the producer gas formed in the generator while the coal is being brought to incandescence by a forced blast. When the proper temperature has been reached in all the vessels the blast is shut off, the stack-valve on top of the superheater, through which the products of combustion escape during the heating-up period, or 'blow,' is closed, and steam is turned into the generator. As soon as the production of water-gas is begun, oil is admitted at the top of the carbureter, is vaporized by the heat of the checker brick, and is taken up by the water-gas and carried through the checker-work in the carbureter and superheater, being converted into a permanent gas by the exposure to heat to which it is thus subjected. After leaving the superheater the gas passes through a water seal, and is then condensed and run into a relief holder, the use of which is necessary for the reason given above. An exhauster draws the gas from this holder and forces it through the purifiers and station meter into the storage holder. The generator-superheater type is the one that is generally employed at present, having replaced almost all the earlier installations of the generator-retort type.

Carbureted water-gas is a mixture of essentially the same gases as are found in coal-gas, though in different proportions, the following being representative analyses of each gas after purification by oxide of iron:

	Coal-gas, per cent.	Carbureted water-gas, per cent.
Carbonic acid.....	1.60	2.7
Oxygen.....	0.39	0.7
Heavy hydrocarbons.....	4.25	12.8
Carbonic oxide.....	8.04	30.7
Hydrogen.....	47.04	32.4
Marsh gas.....	36.02	13.9
Higher paraffins.....		2.4
Benzene vapor.....	0.50	0.6
Nitrogen.....	2.16	3.8
	100.00	100.0

In the case of carbureted water-gas, however, the crude gas contains no ammonia or cyanogen, and a smaller amount of sulphureted hydrogen and sulphur compounds than are found in crude coal-gas. It is estimated that from 70 per cent. to 75 per cent. of the total amount of illuminating gas sold in the United States is carbureted water-gas, while English gas-works, in the year 1900, sent out only 8 per cent. of carbureted water-gas.

DISTRIBUTION OF GAS.

From the gas-holder the gas is conveyed to the consumers by means of *main pipes*, laid under the surface of the streets, from which branch or *service* pipes are led to the houses. The pressure on the mains, which varies in ordinary practice from $1\frac{1}{2}$ to 4 inches of water ($\frac{1}{8}$ pound to $\frac{1}{2}$ pound per square inch), is furnished by the weight of the gas-holder, and is regulated to meet

the variation in the demand for gas by a *governor* on the holder outlet. This governor consists of a valve fastened to an inverted bell sealed in water, the weight of the valve and bell being supported by the pressure of the gas in the mains. If this falls, the bell falls, opening the valve, and so, by allowing more gas to pass, brings the pressure back to the proper point. The amount of pressure can be varied by the use of removable weights to vary the total weight to be supported.

The main pipes vary in internal diameter from 3 to 48 inches. They are usually cast-iron bell and spigot pipes, made in lengths 12 feet long, which are connected together with lead or cement joints, but wrought-iron pipe with screwed joints is sometimes used for the smaller sizes. The services are always made of wrought-iron pipe. (See PIPES.) The mains must be laid so as to drain to certain points, at which provision is made for removing the water and such hydrocarbon vapors as condense from the gas, and the services should drain into the mains.

During the past two or three years the use of high pressure (10 pounds to 20 pounds per square inch) has been advocated for the distribution of gas in localities having a scattered population, and several distribution systems using this pressure have been installed, and are now being operated. In such systems wrought-iron pipe is used exclusively.

The amount of gas supplied to each consumer is measured by means of consumers' meters, which are of two kinds, wet meters and dry meters. The wet meters are similar to the station meter, and were the first ones employed; but on account of various difficulties connected with their use, the chief of which in cold climates is the danger of freezing, they have, in the United States, been almost entirely replaced by dry meters. A dry meter consists of a rectangular box, made of tin plate, divided into two main compartments by a horizontal partition. The lower of these compartments is also divided into two equal parts by a vertical partition. The measuring apparatus consists of two bellows, one in each of the divisions of the lower compartment, each formed by a circular metal disk, to the circumference of which is fastened one edge of a leather diaphragm having its other edge fastened to the central partition, the whole forming a gas-tight space. The alternate opening and closing of these bellows by the pressure of the gas as it is admitted, first into the spaces inside and then into the spaces outside of them, furnishes motion which, by suitable mechanism, is made to operate valves controlling the flow of gas into and out of the bellows and outer spaces in such a way that gas cannot pass simultaneously into and out of any given space, and also to work the train of gears which records the amount of gas passed through the meter. The mechanism also controls the extent to which the bellows can open and close, so that a fixed and definite volume of gas passes into and out of the meter each time one is filled and emptied. The house pipes, which are usually wrought iron, should drain to the meter, where any condensation can be run off if necessary.

BURNERS. The principal forms of gas-burners used for the development of light from the gas are the flat flame, the Argand, and the incandes-

cent. The flat-flame burners are either 'batswing,' in which the gas issues from a narrow slit cut through the rounded top of the tip, or 'fishtail,' in which the gas issues from two circular holes in a flat tip, inclined in such a way that the jets of gas strike against each other and are spread out in a sheet of flame. The tips are usually made either of steatite or of a species of enamel. Although in their early forms these two types produced flames of different shapes, whence their names, as now made they produce flames that are practically identical. The Argand burner is circular in form, and consists of a hollow steatite or metal ring, the top of which is pierced with small holes, through which the gas issues. Air, drawn in by the draught produced by a glass chimney, is supplied to both the inner and outer circumferences of the flame. In the incandescent burner the gas is burned in an atmospheric burner giving a non-luminous flame, the heat of which is used to raise to incandescence a hood or mantle composed of oxides of rare earths, which are very refractory. The mantles most commonly employed are composed of approximately 99 per cent. of thoria and 1 per cent. of ceria. This combination has been found to yield the greatest amount of light, and the use of such mantles increases the amount of light obtainable from a foot of gas to four or five times what it can be made to yield in flat-flame or Argand burners. As the amount of light that may be obtained from gas, when burned in incandescent burners depends largely upon the calorific value, and but slightly upon the illuminating value, as shown by the legal method of testing (for which see PHOTOMETRY), the increasing use of these burners has given rise to a discussion of the advisability of changing from the old illuminating-value standards by which the quality has been judged to a calorific-value standard. In some cities in Europe, where it is possible to make a gas of good calorific but low illuminating value, much more cheaply than a gas with a higher illuminating value, the legal illuminating value has been reduced to ten candles. In London the legal standard for two of the three gas companies has been in the last two years reduced from 16 to 14 candles, and the London County Council gave notice, in 1902, of its intention to promote a bill in Parliament making the change compulsory upon the third company.

USE OF ILLUMINATING GAS FOR FUEL PURPOSES. During recent years there has been a large development of the use of gas for cooking; for such heating as is not required to be continuous; and for industrial purposes where it is important to have a high and easily controllable temperature. A great number of gas companies have been very active in seeking for business along these lines, until in some cases the output of gas for fuel purposes is greater than that for illuminating purposes. This development of the sale of gas for fuel also affords an argument in favor of the adoption of a calorific-value standard, as mentioned above.

The total quantity of gas reported as sold in the United States for lighting and heating during the year 1900, according to the Twelfth Census, was 68,265,496,168 cubic feet, as compared with 36,519,511,510 reported for 1890, an increase of 87 per cent. Of the amount sold in

1900, about 1,712,000,000 was a by-product from the manufacture of coke, and was sold to distributing companies for resale to consumers; the balance of the output was made by 877 gas-works, which number may be compared with 742 reported in 1890, and only 30 in 1850. The capital invested in the gas industry, according to the reports, increased from \$6,674,000 in 1850 to \$258,771,745 in 1890 and \$567,000,506 in 1900. The total receipts for gas sold in 1900 were \$69,432,582, or \$1.035 per thousand cubic feet, which latter figure may be compared with \$1.42 per thousand in 1890. By-products sold in 1900, including tar, coke, and ammoniacal liquor (not separately reported), amounted to about \$4,283,204, which, with \$2,000,907 from rents and sales of appliances, brought the total revenues of the gas-works up to \$75,716,693. The total output of English gas-works in 1900 was about 150,000,000,000 cubic feet.

SANITARY ASPECTS. Toward the close of the nineteenth century the attention both of sanitarians and of those interested in gas manufacture was directed to the sanitary aspects of the use of illuminating gas. The importance of this phase of the subject had recently been increased by the frequent substitution of water-gas for coal-gas. In water-gas the most poisonous agent—carbonic acid—is increased, as compared with coal-gas, from 6 or 7 per cent. to about 30 per cent. This change, however, was not necessary to make illuminating gas an active poison to breathe. The danger in the use of illuminating gas arises from two sources: (1) From unburned gas which escapes into the atmosphere through defective pipes or fixtures, or through burners accidentally open, and (2) from vitiation of the atmosphere through the products of burning gas.

The National Board of Fire Underwriters has published a table of gas losses compiled from data furnished by fifteen companies, which shows that over 14 per cent. of the total product of gas plants leaks into the streets and houses of the cities supplied. The danger to houses from escaping gas is much greater in the winter time, when the street surface is frozen, and when houses, on account of their higher temperature, act as chimneys to draw in the ground air, and with it the gas which has leaked into the soil. Gas thus escaping may follow water or sewer pipes, and enter even those houses which have no gas connections.

In order to remove the constant menace to life and property, through explosion and asphyxiation, which is afforded by leaky gas-mains, the whole matter should be under the strictest surveillance and control by the public. The introduction in our large cities of subways for underground pipes and wires would remedy the evil by rendering gas-mains easily accessible for constant inspection. In this way the slightest leak would be detected. The danger of deterioration of the mains through rust, and of their breaking through settlement of the soil, would also be removed.

While the consumption of gas does vitiate the atmosphere of a room to a certain extent, an ideal system of ventilation is possible, in which burning gas is not a hindrance, but an essential part. An example of such a system is the British Houses of Parliament, in which,

by means of flues placed over the jets, the heat or surplus energy of the gas-flame assists in producing a pure atmosphere. A similar system of ventilation could be carried on in an ordinary room with a thirteen-foot ceiling, in conjunction with the chimney in the room, and the combustion of one cubic foot of gas could be made, by a suitable flue, to change the atmosphere of a room $15 \times 15 \times 11$ feet once per hour. In this event, the three feet per hour consumed by an incandescent burner could be made abundantly to light and ventilate that space.

BIBLIOGRAPHY. Journals devoted to the subject of the manufacture and distribution of gas appear in all the leading languages, and of these the *Journal of Gas Lighting* (London) was first issued in 1849. For a full description of the subject of gas-lighting, see: Articles on "Gas" in *Encyclopædia of Chemistry* (Philadelphia, 1877); Spon's *Encyclopædia of Industrial Arts* (London and New York, 1879); Thorp, *Dictionary of Applied Chemistry* (London, 1891); Wagner, *Handbook of Chemical Technology* (New York, 1895); Richards, *A Practical Treatise on the Manufacture and Distribution of Coal Gas* (London, 1877); King's *Treatise on the Science and Practice of the Manufacture and Distribution of Coal Gas*, edited by Newbigging and Fewtrell (London, 1878); Colyer, *Gas Works: Their Arrangement, Construction, Plant, and Machinery* (London, 1884); Chester, *Bibliography of Coal Gas* (Nottingham, 1892); Atkinson Butterfield, *The Chemistry of Gas Manufacture* (Philadelphia, 1896); O'Connor, *The Gas Engineer's Pocket-Book* (New York, 1898); Wanklyn, *The Gas Engineer's Chemical Manual* (London, 1888); Dent and others, "Lighting," in *Chemical Technology*, vol. ii. (Philadelphia, 1895); Hunt, "Gas Lighting," in *Chemical Technology*, vol. iii. (Philadelphia, 1900).

GAS, NATURAL. A gaseous member of the paraffin series (see HYDROCARBONS), petroleum being a liquid member and asphalt a solid one. It is formed by the decomposition of animal matter, as in the case of the Ohio and Indiana gas, and from vegetable matter, as in the Pennsylvania gas, this decay having occurred within the rocks and probably at moderate temperatures. When once formed it accumulates in the pores of the rocks in which it originated, or in overlying layers, but is usually kept from escaping to the surface by the presence of some layer of impervious rock. It is then obtained by the piercing of these strata by wells, or where the beds have been fissured by folding or faulting it may issue from natural channels.

COMPOSITION. Natural gas is made up chiefly of marsh gas or methane (CH_4), which may form 90 or 95 per cent. of the entire volume of the gas; but other gaseous paraffins, such as ethane (C_2H_6) and propane (C_3H_8), are not uncommonly present. Since the liquefying pressure of the last two gases is lower than the pressure found to exist in many natural-gas reservoirs, it is probable that they exist in liquid form within the pores of the rock, and vaporize when they pass out into the well-tube. Besides the gaseous paraffins natural gas often contains small but varying amounts of nitrogen, carbon dioxide, carbon monoxide, olefiant gas, oxygen, hydrogen, ammonia, and hydrogen sulphide. The following

analyses give the composition of natural gas from different American localities:

	1	2	3	4	5	6
Methane.....	93.35	94.16	89.65	90.05	97.70	90.09
Ethylene.....	.35	.30				
Carbonic oxide	.41	.55	.26			
Carbon dioxide	.25	.29	.35			trace
Oxygen.....	.39	.30		.41	.20	trace
Nitrogen.....	3.41	2.80		2.54	2.02	9.91
Sulphureted hydrogen.....	.20	.20				trace
Hydrogen.....	1.64	1.42	.56			
Ethane.....	.....	.....	4.39			

1. Findlay, Ohio. 2. Kokomo, Ind. 3. Leechburg, Pa. 4. Fredonia, N. Y. 5. Murrysburg, Pa. 6. Racoon Creek.

MODE OF OCCURRENCE. Natural gas is found most often in sandstone and shale, but may also occur in limestone. Two types of accumulation may be recognized, viz.: in impervious rocks, such as shales and limestones, and in porous rocks, such as sandstone. The former type or shale gas usually forms small wells of varying pressure, and is not necessarily associated with petroleum; the deposits have staying qualities, and do not depend on the structural arrangement of the containing strata. Sandstone or reservoir gas, on the other hand, is found in great wells, often accompanied by oil, and while the rock pressure in any one area is fairly constant, at the same time these wells usually give out suddenly. The structure of limestone and sandstone formations containing natural gas, and, indeed, also petroleum, is often that of a low anticlinal, the gas and oil being found at and near the crest, respectively, while on either flank there is often an abundance of water. This theory of gas accumulation is known as the 'anticlinal theory,' and was developed by Profs. E. Orton and I. C. White. It has been noticed in all gas-fields that when the reservoir is tapped the gas usually rushes out as though under great pressure, this being spoken of as rock pressure. Prof. E. Orton believed that this pressure was hydrostatic, and due to the head of water in the rocks overlying the gas, the amount of pressure in the Ohio field being equal to a column of water whose height was equal to the elevation of Lake Erie above the gas-bearing stratum. While this theory may hold in some cases, still I. C. White has pointed out that in others the rock pressure is much greater than the artesian pressure in the same region, and furthermore that the exhaustion of the gas is not always followed by a flow of water. In such cases the rock pressure must be due to the expansive force of the gas. The original rock pressure varies in different fields, and is not infrequently as high as 300 or 400 pounds per square inch at the mouth of the well, and in some wells may exceed 1000 pounds per square inch. Several of the newer wells in West Virginia having a depth of from 2700 to 3200 feet showed a rock pressure ranging from 1000 pounds to 1300 pounds per square inch. A decrease in pressure is always likely to follow with time, as in the case of the first well opened at Findlay, Ohio, where the pressure fell from 450 pounds in 1886 to 170 pounds in 1890. In the early days of gas-well drilling the supply appeared so inexhaustible that the newly drilled wells were often allowed to blow off gas for several days or weeks before attempts were made to cap them.

DISTRIBUTION. The productive horizons of natural gas cover the entire series of Paleozoic rocks, and reservoirs are found even in Tertiary strata. The main supply for the United States comes from the Appalachian field, and the Ohio-Indiana field. The former extends from New York into Tennessee, and contains specially productive districts in Pennsylvania and West Virginia. The gas is obtained from several sandstone beds within the Devonian, and is closely associated with oil, the two owing their accumulation to the presence of a series of low anticlinal folds. The sandstone beds or 'sands' are separated by varying vertical distances, and are known by different names. The Ohio-Indiana field is unique in that the gas which is associated with oil occurs in Trenton limestone, along a dome-shaped uplift of rock known as the Cincinnati Arch, and especially where the rock has been rendered somewhat porous by dolomitization. This anticline extends in a northeast-southwest direction from Indiana into Ohio. In addition gas has also been obtained in Ohio from the Sub-Carboniferous. Both of these areas in Ohio are now nearly exhausted, and the supply obtained within the State comes from new and small fields. In southeastern Kansas gas is obtained from the Carboniferous shales, the area which is known as the Iola gas-field having come into prominence during the last few years. Its product is important because of the fact that the field lies not far from the Ozark zinc region, and the gas is employed for smelting the ores. The gas is found at depths ranging from 500 to 1000 feet. Some natural gas is also obtained from Kentucky, Illinois, Texas, South Dakota, Colorado, California, Missouri, and Texas, but the amount produced in most cases is small.

MINING AND USES. The methods used for drilling gas-wells are the same as those employed for sinking oil-wells. When the gas is first struck the pressure has in rare cases been sufficiently great to blow out the string of drilling tools weighing over 1000 pounds. As soon as practicable the well is capped, and the supply is piped to the site of consumption or to storage tanks. As the gas is often required for use at some distance from the well, the construction of pipe-lines has become an important feature of the natural-gas industry. With high rock pressure the gas may reach the market unaided, but with low pressure it is necessary to locate pumping stations at different points along the pipe. The pipes used vary in diameter from two inches to three feet, and are made of wrought iron or steel. One of the first lines was that laid in 1882 from Wilcox to Colegrove, Pa., a distance of 20 miles. Later, with the depletion of the gas-fields around Pittsburgh, it became necessary to pipe the gas for that city from greater distances, and at the present time some of it is being piped from Doddridge County, W. Va., a distance of over 100 miles. The pipe-lines from Wetzel County, W. Va., to Akron and Canton, Ohio, are over 150 miles long. So extensive has been the construction of pipe-lines that at the close of 1901 there were 22,000 miles of them in operation.

When first used the price of natural gas was low and no attempt was made to measure it, as it appeared to be widely distributed and to exist in inexhaustible quantities, but the giving out of some of the districts and the rapid fall in rock

pressure led to the use of meters and a rise in the value of the gas. On account of its cleanliness and excellent calorific power, natural gas has become an important source of light, heat, and power in many States, so that in 1901 it was used in thirteen States, by 1545 companies, representing a total of 5742 manufacturing establishments, including iron-mills, steel-works, glass-factories, brick-factories, and lead and zinc smelters. In addition to this it was used in many hundred private houses for heating or illumination.

Natural gas has a high calorific power, 1000 cubic feet having the power to evaporate 1000 pounds of water at 212° F. About 50 candle-power can be obtained by the consumption of 2½ cubic feet per hour. In fuel value, 12 cubic feet of natural gas is equal to about one pound of coal. Its illuminating power is low, unless used with some patent burner, such as the Welsbach light. The production of the United States in 1901 was valued at \$27,067,500, exclusive of the amount piped in from Canada.

HISTORY. The use of natural gas in China and Persia is said to date back to a very remote period. In the United States General Washington is said to have visited a burning spring on the Great Kanawha River, near the present site of Charleston, W. Va.; but the first recorded use of natural gas in this country was in 1821 at Fredonia, N. Y., where it was piped from a well for illuminating purposes. In 1841 it was used in the Great Kanawha Valley for heating salt-furnaces, but its extensive use did not begin until 1872, at Fairview, Pa. In 1875 it was first used for iron-smelting at Etna Borough, near Pittsburgh, and in 1886 was brought to Pittsburgh from the Haymaker well near Murrysburg, 19 miles distant. Since then its use has steadily increased.

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GASCOIGNE, gäs-koin', GEORGE (c.1535-77). An English poet. He was born about 1535, the son of Sir John Gascoigne, of Cardington, Bedfordshire, and was educated at Trinity College, Cambridge, but left without a degree, entering, it is said, the Middle Temple before 1548. In 1555 he became a student of Gray's Inn; in 1557-59 he was member of Parliament; about 1560 he married and settled at Walthamstow. To escape his numerous creditors he went to Holland in 1572, where he served with distinction under William, Prince of Orange; but was captured by the Spaniards under the walls of Leyden and sent back to England after an imprisonment of four months. He accompanied Queen Elizabeth on her memorable visit to Kenilworth in 1575, and was commissioned by Leicester to write verses and masques for her entertainment. These appeared in *The Princely Pleasures* (1576). He died October 7, 1577, while on a visit to his friend George Whetstone, at Stamford, Lincolnshire. Gascoigne is best known by his lyrics, such as "The Arraignment of a Lover" and "A Strange Passion of a Lover." But much of his other work is of very great historical interest. *The Supposes*, an adaptation of Ariosto's *Gli Suppositi*, is the earliest extant comedy in English prose. It was produced at Gray's Inn in 1566. Aided by Francis Kinwelmersh, he wrote *Jocasta*, a free rendering of Euripides's *Phænissæ*. This is the second earliest English tragedy in blank verse. *The Steel Glass* (1576), written in blank verse, is our earliest regular verse satire. *Certain Notes of Instruction Concerning the Making of Blank Verse* (1575) is the earliest English critical essay. An edition of Gascoigne's *Works* was published by Jeffes (London, 1587). His *Complete Poems* were edited by W. C. Hazlitt, Roxburghe Library (London, 1868-69). For his principal poems, consult the excellent edition, with full biographical notes, edited by Arber (London, 1868). Consult Lee, *Dictionary of National Biography*.

GASCOIGNÉ, Sir WILLIAM (c.1350-1419). An English judge during the reign of Henry IV. He was made a sergeant-at-law in 1397, and in 1400 became Chief Justice of the King's Bench. In this high office he distinguished himself both by his integrity and ability, and the older English law reports contain many abstracts of his opinions, arguments, and decisions. In July, 1403, he was joined with the Earl of Westmoreland in a commission for levying forces against the insurrection of Henry ('Hotspur') Percy. In popular, though unauthenticated, story he is chiefly celebrated for the fearlessness with which he defended the immunities of his judicial office from interference by the Court. On one occasion, the legend runs, when one of the dissolute companions of young Prince Henry, afterwards Henry V., was arraigned before Gascoigne for felony, the Prince demanded his release, and, on being ordered out of the courtroom, rushed upon the judge and struck him. Gascoigne immediately committed the Prince to prison, and Henry, so the story goes, conscience-stricken, submitted. The King, on being informed of the occurrence, is said to have thanked God for having given him "both a judge who knew how to administer the laws and a son who respected their authority." Shakespeare, in *Henry*

IV., Part II., represents the young Henry V. as bidding Gascoigne retain, under a new king, the office whose honor he knew so well how to defend. Historically, this is untrue, as Gascoigne seems to have resigned immediately after Henry V.'s accession. He died December 17, 1419.

GASCON. A fish. See SAUREL.

GASCONADE, gäs'kōn-äd'. A right tributary of the Missouri, rising in Wright County, Mo. (Map: Missouri, E 3). It flows north-northeast, and empties into the Missouri at Gasconade after a course of about 250 miles. It is partly navigable for light steamboats at high water.

GASCON, gäs'kōn', **GASCONNADE**, gäs'kō-näd'. A term employed to denote a boaster or braggart, and any extravagant or absurd vaunting, the inhabitants of the district once known as Gascony having long been notorious in this respect.

GAS'CONY (Fr. *Gasconne*, Lat. *Vasconia*, from *Vascones*, the Basques). An ancient duchy in the southwest of France. Its boundaries were the Bay of Biscay, the River Garonne, and the Western Pyrenees. The modern departments of Landes, Gers, Hautes-Pyrénées, and the southern portions of Haute-Garonne, Tarn-et-Garonne, and Lot-et-Garonne are embraced within its ancient boundaries. It derived its name from the Basques or Vasques, who, driven by the Visigoths from their own territories on the southern slope of the Western Pyrenees, crossed to the northern side of that mountain range in the middle of the sixth century, and settled in the former Roman district of Aquitania Tertia or Novempopulana. In 602, after an obstinate resistance, the Basques were forced to submit to the Franks. They passed under the sovereignty of the dukes of Aquitania, who for a time were independent of the Crown, but were afterwards conquered by Pepin and later by Charles the Great. Subsequently the district became incorporated with Aquitania (q.v.). Consult: Monlezun, *Histoire de la Gasconne* (6 vols., Auch, 1846-50); Blade, *Contes populaires de la Gasconne* (Paris, 1886). Blade is also the author of six other works on the subject.

GAS-ENGINES. A name given to certain prime movers in which the expansive energy developed by an explosive or inflammable gas upon ignition communicates reciprocating motion to a piston within a cylinder. From the fact that the ignition and consequent development of heat take place within the engine cylinder itself, these motors are often called internal-combustion engines. The combustible mixture used may be any hydrocarbon gas or vapor mixed with a suitable proportion of atmospheric air.

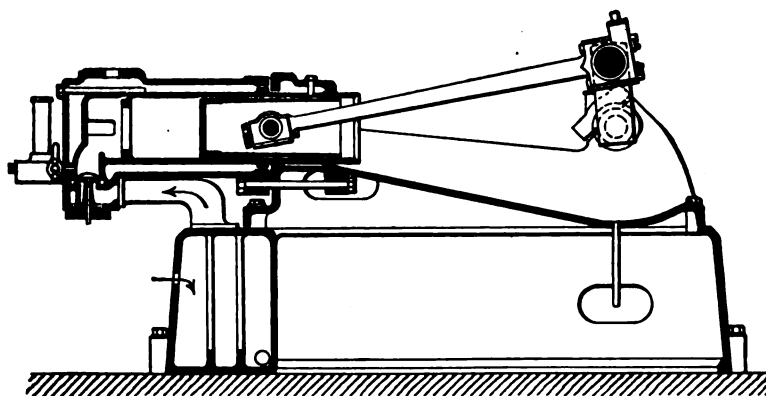
HISTORICAL DEVELOPMENT. In 1678 the Abbé d'Hautefeuille invented an engine in which the explosive power of gunpowder was employed to drive a piston in a cylinder. This was the prototype of the modern gas-engine. Two years later the eminent Dutch physicist Christian Huygens devised a similar gunpowder engine. No further development of the internal-combustion engine occurred until 1791, when John Barber, an Englishman, specified in a patent the use of a mixture of a hydrocarbon gas and air and its explosion in a vessel which he called an exploder. Some years later a fellow countryman of Barber's, John Street, took out a patent for

the production of an explosive vapor by means of a liquid and air, ignited by a flame, in a suitable cylinder so as to drive machinery. In 1799 Philip Tebon, a Frenchman, took out a patent in which was described the construction and principle of operation of an engine using coal-gas as the explosive, and two years later he secured a second patent on an improved form of the same engine. Several inventors followed Tebon with designs for gas-engines, some of which were highly ingenious machines, but none of which attained any practical utility. Indeed, up to 1860 no internal-combustion engine had appeared which was capable of regular and comparatively efficient work.

In 1860 Lenoir, a Frenchman, invented the first practical gas-engine. This engine resembled in external appearance a simple-cylinder horizontal steam-engine, and was double-acting. Gas was drawn into the engine during the first half of the forward stroke, and exploded by an electric spark from a Ruhmkorff coil when the piston was commencing the second half of the forward stroke. The exploding gases, after having done their work, were drawn out through the exhaust on the return stroke, during which work was being done by a similar explosion on the other side of the piston. A water-jacket prevented the cylinder walls from becoming overheated. The engine ran smoothly and regularly, and its development raised high hopes that the successful substitute for the steam-engine had appeared. The machine, however, was enormously expensive in its consumption of gas, and had so many other defects that it soon disappeared. The principal good accomplished by Lenoir's work was to direct attention again to the gas-engine, which had been lost sight of in

operations for each impulse. No engine was built by Beau de Rochas, and for sixteen years the existence of his invention remained practically unnoticed. Meanwhile, in 1867, two Germans, Otto and Langen, patented an engine in which the explosion of gases in the cylinder served only to obtain a partial vacuum underneath the piston, which was, therefore, forced down by the excess of atmospheric pressure above it. This engine was very crude mechanically, but it consumed about one-half the gas consumed by the Lenoir engine, and large numbers were sold. This was the first atmospheric engine to attain commercial importance.

In 1878 Dr. Otto, encouraged by his previous success, brought out his gas-engine. In this engine the German engineer reinvented the Beau de Rochas cycle, and applied it in the construction of an actual engine. In the Otto engine the cylinder was continued back beyond the stroke of the piston to form a compression chamber into which the mixture of air and gas was drawn during the forward stroke of the piston. The mixture was compressed in this chamber during the return stroke, the pressure rising at the end of the stroke to from 45 to 60 pounds per square inch. At this point in the cycle of movements a flame was brought into contact with the compressed gases, and they were ignited. This ignition or explosion raised the temperature of the gases to 1500° Centigrade, and drove forward the piston under a pressure of about 150 pounds per square inch. During the second return stroke the piston drove out the products of combustion. The heating of the cylinder was prevented by a water-jacket. Special attention was paid by the inventor to the efficiency of his engine, and in order to increase it he diluted



LONGITUDINAL SECTION OF OTTO-CROSSLEY GAS-ENGINE.

the labors of developing the steam-engine. Not much importance came of this renewed study until 1862, when M. Beau de Rochas took out a patent for the working principles of an internal-combustion motor. These principles were set forth as follows: During the forward stroke of the piston the explosive mixture was to be drawn into the cylinder, and during the return stroke this volume of gas was to be compressed; at the beginning of the second forward stroke the explosion was to take place, driving the piston forward, the gases being expelled during the second return stroke. As will be observed, the invention called for an engine with a cycle of four distinct

the air and gas drawn into the cylinder with a portion of the gases already burnt in the previous stroke. This caused a less violent explosion, the gases continuing to burn during the entire stroke of the piston. As the piston received a driving impulse only once in every four strokes, or two revolutions, regularity of motion had to be secured by heavy fly-wheels. Otto's engine was a

marked improvement over any previous internal-combustion engine. It consumed only 915 liters of gas per horse-power per hour, as compared with a consumption of 1380 liters by the Otto and Langen engine, and 2700 liters by the Lenoir engine. After the expiration of Otto's patents various other inventors began turning out four-stroke cycle engines, and some of them have succeeded, by improvements in mechanical details, and by using gas at higher initial temperatures, in reducing the consumption of fuel and increasing the efficiency of the motor generally. Another set of inventors devoted themselves to the devising of different

cycles. Of these only Dugald-Clerk and Griffin will be referred to at present.

In the ideal internal-combustion motor we should have at least one explosion or impulse for every revolution, instead of one every two revolutions, as in the Otto engine. For this reason inventors have tried to construct gas-engines with a two-stroke cycle. One of the most notable of these will be described, but it may be remarked at the beginning that no motor of this type has been able to compete with those of the Otto type. The two-stroke cycle engine was invented by Dugald-Clerk. There were two cylinders of equal diameter placed side by side; the first of these was the power-cylinder, in which the explosion took place; the other was used for compressing the explosion mixture, and also for supplying at each revolution a volume of fresh air for blowing out the products of combustion in the power-cylinder. The Clerk engine had the advantage of giving an impulse every revolution, and thus permitted the use of a lighter fly-wheel; its great disadvantage was that, owing to the sudden combustion, it was less efficient than the Otto engine. Clerk's two-stroke cycle engine was followed by several others of the same type, but of different construction. Griffin's engine had two explosions for every three revolutions, or six strokes of the piston, and was double-acting. The cycle of operation was as follows: (1) Gases drawn into the cylinder; (2) compression of gases; (3) ignition and expansion; (4) products of combustion expelled; (5) volume of fresh air drawn into cylinder to expel products of combustion; (6) this volume of fresh air expelled.

WORKING PRINCIPLES. Some notion of the working principles of the gas-engine has been conveyed in the descriptions of the preceding section. Broadly speaking, gas-engines may be divided into the following classes: (1) Engines igniting at constant volume without previous compression; (2) engines igniting at constant volume with previous compression; and (3) engines igniting at constant pressure with previous compression. In the first class a specified amount of gas is drawn into the cylinder at ordinary atmospheric pressure, the inlet valves are then closed, and the charge is ignited, that is, a constant volume of gas at atmospheric pressure, or without compression, is ignited to give the impulse. To this class belongs the Lenoir engine and also, as a subclass, the Otto and Langen engine previously described. In the second class, as in the first class, the volume of gas is constant, but it is compressed before explosion. To this class belong the Otto engine and by far the greater number of other gas-engines now in use. In the third class the gas is compressed outside of the engine cylinder, and enters the cylinder under pressure, ignition taking place as soon as it emerges at the inlet. To this class belongs the Brayton engine.

EXPLOSIVES USED. The explosives used in gas-engines are coal-gas, water-gas, vapors, produced by a mixture of air and petroleum or its volatile distillates. Engines using oil vapors are often called oil-engines, gasoline-engines, etc., and they comprise the necessary apparatus for providing the vapor, in addition to the parts usual to the gas-engine. These vapor-producing apparatus are of numerous forms. Besides the

kinds of gases and vapors mentioned, any carbon-hydrogen gas may be employed. Thus, in recent years, there has been quite an extensive use of the waste gases from the blast-furnaces (see IRON AND STEEL) for operating gas-engines.

IGNITION. The ignition of the explosive mixture is usually performed by one of the following methods: A flame may be introduced into the cylinder or uncovered to the gases in the cylinder by the opening of a suitable port in the cylinder walls; an electric spark may be made to pass through the gases between two electrodes entering the cylinder, or a tube of porcelain or iron heated to incandescence by an external flame is uncovered to the gases by a port in the cylinder walls.

CAPACITY AND EFFICIENCY. Gas-engines are frequently built up to 400 and 500 horse-power. In America even larger gas-engines have been constructed, and the Westinghouse Works now build these machines as large as 650 horse-power, one of the latter capacity being shown in Fig. 3 of the accompanying plate. By the efficiency of a gas-engine is meant the percentage of the total heat units in the coal or oil used which the engine converts into work. This percentage is from 17 to 19 per cent. for engines using gas from coal, and from 14 to 16 per cent. for oil-engines. The efficiency of the steam-engine is about 12 per cent. of the coal.

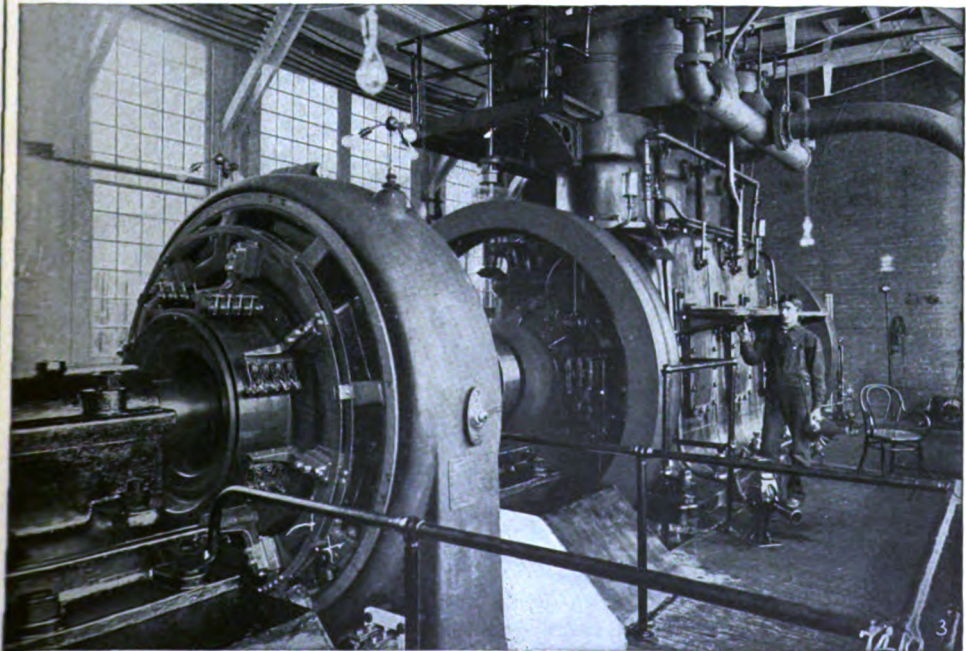
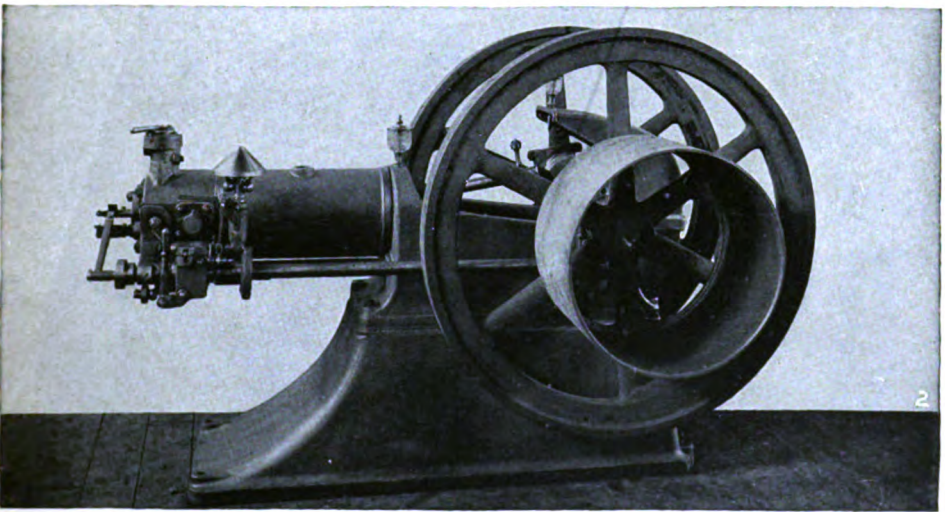
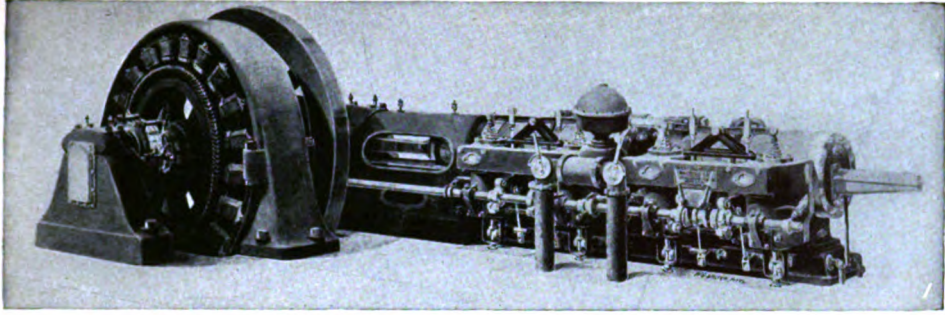
USES. Gas-engines may be used for any purpose that a steam-engine is used for within the limits of their capacity. As compared with the steam-engine its qualities are as follows: It requires no boiler and only small storage space for oil or gas; it is ready for operation at a moment's notice, since no time is lost in getting up steam, as in a steam boiler; there being no fire or furnace, there are no ashes; it does not require a skilled operator to run it. These qualities, as will readily be seen, give the gas-engine a peculiar field of usefulness of its own. A few of its familiar uses will illustrate this point. These are automobile propulsion, launch and yacht engines, submarine boat engines, and small industrial works where small amounts of power are required only occasionally. In each of these cases the fact that a boiler, furnace, and store of fuel are obviated by its use makes the gas-engine a particularly suitable motor.

BIBLIOGRAPHY. Among the many books dealing with gas-engines, the following will be found useful: Hutton, *Heat and Heat Engines* (New York, 1899); Dugald-Clerk, *Theory of the Gas Engine* (New York, 1891); id., *The Gas and Oil Engine* (New York, 1899); Donkin, *A Text-Book on Gas, Oil, and Air Engines* (London, 1900); Hiscox, *Gas, Gasoline, and Oil Vapor Engines* (New York, 1900); Parsell and Weed, *Gas Engine Construction* (New York, 1900).

GASES, ANALYSIS OF. See ANALYSIS, CHEMICAL.

GASES, GENERAL PROPERTIES OF. The study of the nature and properties of gases has yielded many of the most important results of modern science. Practically the entire structure of modern chemistry rests on our knowledge of gases. The birth of the science, as already explained in the article CHEMISTRY, followed almost immediately the discovery of the common gases. The fruitful theories of modern organic chemistry are based entirely on the general prop-

GAS-ENGINES



1. WESTINGHOUSE SINGLE CRANK HORIZONTAL DOUBLE-ACTING GAS-ENGINE.

2. OTTO GAS-ENGINE.

3. WESTINGHOUSE 8-CYLINDER VERTICAL GAS-ENGINE Operating Direct Current Engine Type Generator.

erties of gases; and in the latter part of the nineteenth century general theoretical chemistry received a powerful impulse by the extension of the laws of gases to dilute solutions. (See SOLUTION.) On the other hand, the physicist has been led, by the study of gases, to a clear and simple explanation of the phenomena of heat and of many other general phenomena forming important chapters in modern physics. And, of course, through chemistry and physics the applied and natural sciences, too, owe a great deal to our knowledge of gases. All this importance of gases is due to the comparative simplicity of the laws followed by them. The simplicity of the laws is, in turn, readily explained from the standpoint of the molecular conception. Molecules are minute particles of matter. When they are very near to one another there must naturally come into play, between them, forces whose effects are practically nothing when the molecules are widely separated. Under ordinary pressures a substance occupies a much greater volume in the gaseous than in the liquid or solid state. Thus, an amount of water occupying, at 0° C., one cubic centimeter if liquid, would, if vaporized at the same temperature and under ordinary atmospheric pressure, occupy over 773 cubic centimeters. Evidently the molecules of a gaseous substance must be very far apart, and their mutual influence very slight. In other words, the number of causes determining the properties of gases must be smaller, and hence the properties themselves must be less complex than those of liquids or solids. Of course, as the volume within which a gas is compressed is made smaller and smaller, the relative simplicity of properties gradually disappears. (See MOLECULES—MOLECULAR WEIGHTS.) Under certain conditions of pressure and temperature, the properties of a substance in the gaseous and liquid states even become identical. (See CRITICAL POINT.) This shows that simplicity of properties, while generally found in the gaseous state, is not strictly characteristic of it. Other characteristics may be found mentioned under AGGREGATION, STATES OF.

It is explained in the articles on HYDROSTATICS and HYDRODYNAMICS how liquids and gases have certain properties in common, viz. all those which depend upon fluid pressure, which is defined as the force per unit area. It is shown in those articles:

(1) The pressure at any point in a gas is the same in all directions, and its value is $\rho gh + P$, where ρ is the average density of the gas above the point, g is the acceleration due to gravity of a freely falling body, h is the vertical distance from the point to the top of the gas (if it is inclosed in a reservoir), and P is a pressure uniform throughout the gas, due to the reaction of the walls of the reservoir against the outward expansive force of the gas. In all ordinary cases of gases h is not large, and so ρgh may be neglected, because ρ is extremely small; and P is the principal term. In the case of the atmosphere, however, P is zero and h large.

(2) The pressure of the gas against the containing walls or against any solid immersed in it is perpendicular to the solid, if the gas is not flowing.

(3) Archimedes's principle applies to gases, viz. if a solid or a drop of liquid is immersed

in the gas it is buoyed up with a force equal to the weight of the displaced gas.

(4) If a gas escapes from a reservoir through a small opening in a thin wall, its velocity of

'efflux' is given by the formula $v = \sqrt{\frac{2p}{\rho}}$, where p

is the difference in pressure of the gas inside the reservoir and outside. (This is not the total pressure, but the partial pressure due to this particular gas. See Dalton's Law, below.)

(5) If a gas is flowing steadily but slowly through a tube or irregular cross-section, the pressure is greatest where the velocity is least, and vice versa. This is the principle of the 'atomizer,' the 'injector' for steam boilers, etc.

The densities of gases at 0° C. and standard pressure are as follows:

Air, 0.001293; carbon dioxide, 0.01974; hydrogen, 0.0000896; oxygen, 0.001430. The special properties of gases have been stated in the form of laws:

DALTON'S LAW. If several gases are contained in the same reservoir they are distributed uniformly through it, so that the mixture is everywhere the same, and the total pressure on the walls is the sum of the partial pressures; by 'partial' pressure is meant that pressure which each gas by itself would exert on the walls if the other gases were removed. This law of pressures has been shown recently to be not perfectly exact.

BOYLE'S LAW. If the temperature of a gas is kept constant, and its volume changes, the resulting pressure and density are such that one is proportional to the other. In symbols,

$p = k\rho$; or writing $\frac{m}{v}$ for ρ , $pv = km$, where

m is the mass and v is the volume. This law, too, is only approximate; for as the pressure on the gas is increased, the product pv does not remain a constant quantity, but first decreases and then increases. (For hydrogen gas the product pv increases without any preliminary decrease.) This means that at high pressures gases are less compressible than they would be if Boyle's law were obeyed exactly. This law, $pv = \text{constant}$ at constant temperatures, was first stated by Robert Boyle in 1662 as the result of careful experiments on air; fourteen years afterwards it was published by Mariotte.

It is a consequence of Boyle's law that the elasticity of a gas at constant temperature numerically equals the pressure. If a gas is compressed rapidly its temperature rises, and so the pressure is increased; the elasticity for a sudden compression or rarefaction equals γp , where γ is the ratio of the two specific heats for the gas and for ordinary gases has the value 1.4. (See ELASTICITY.) An instrument for measuring high pressures in a fluid is made, called a closed 'manometer,' the principle of which depends upon Boyle's law. It consists of a device to trap a definite mass of gas in a closed tube by means of some liquid, such as mercury, and to have the column of mercury compress the gas as the pressure to be measured is increased; the volume of the gas varies inversely as the pressure on it.

If a gas is allowed to expand freely, doing no external work—e.g. take two reservoirs connected by a tube with a stop-cock, compress the gas in

one and rarefy it in the other, then let the stop-cock be opened—it is observed that there is practically no energy required to produce the expansion. This shows that any forces of attraction between the molecules must be extremely small. (See HEAT.) It is found by experiment that if the pressure on a gas is kept constant, but the temperature changed, the volume changes at the rate given by the formula

$$v = v_0(1 + \beta t),$$

where v is the volume at $t^\circ \text{C.}$; v_0 , that at 0° ; β is a constant, the same for all gases approximately. Similarly, if the volume is kept constant, and the temperature changed, the pressure will change according to the law

$$p = p_0(1 + \beta t),$$

where p is the pressure at $t^\circ \text{C.}$; p_0 , that at 0° ; β is a constant the same for all gases and the same as in the above formula for the change of volume. The value of this 'coefficient of expansion' is almost exactly $\frac{1}{273}$ or 0.003662. This law for the change in pressure or volume of a gas as the temperature is altered, viz. that β is the same for all gases, was discovered almost simultaneously by Charles, Dalton, and Gay-Lussac.

Another law, known as the 'law of combining volumes,' may be found explained under CHEMISTRY.

The experimental laws for gases may be deduced theoretically for a mechanical system of perfectly elastic spheres thrown at random into a space bounded by rigid walls. If the number of spheres is great enough to allow the application of the principle of statistics, it can be shown that the pressure on the walls owing to the impact of the spheres is $p = \frac{1}{3} m n u^2$, where m is the mass of each sphere, n is the number of spheres per cubic centimeter, u^2 is the mean value of the squared velocities of the spheres. The density is then $m n$; and the formula may be written $p = \frac{1}{3} \rho u^2$.

It may also be shown that the mean kinetic energy of translation of the spheres — $\frac{1}{2} m u^2$ — has properties identical with those of the temperature of a gas; consequently the above value of the pressure satisfies Boyle's law. The law for the expansion with temperature may also be derived, viz. that β is the same for all gases.

Again, if there are several sets of spheres inclosed in the same space

$$p = \frac{1}{3} (m_1 n_1 u_1^2 + m_2 n_2 u_2^2 + \text{etc.}),$$

which is Dalton's law. And if there is equilibrium

$$\frac{1}{3} m_1 u_1^2 = \frac{1}{3} m_2 u_2^2 + \text{etc.},$$

and therefore

$$p = \frac{1}{3} m_1 u_1^2 (n_1 + n_2 + \text{etc.}),$$

which states that for a given value of $\frac{1}{3} m_1 u_1^2$ (i.e. temperature) the pressure depends simply on the number of the spheres per cubic centimeter, not on their masses. This is equivalent to Avogadro's rule (q.v.), another of the general principles concerning gases. Looked at in a different way: If there are two sets of spheres in different reservoirs at the same pressure, $m_1 n_1 u_1^2 = m_2 n_2 u_2^2$; if further their values of $m u^2$ are the same (i.e. their temperatures), $m_1 u_1^2 = m_2 u_2^2$. Hence $n_1 = n_2$, or they have the same number of spheres per cubic centimeter. The densities of the two are $\rho_1 = m_1 n_1$, $\rho_2 = m_2 n_2$; so if the pressures and 'temperatures' are the same

$$\frac{m_1}{m_2} = \frac{\rho_1}{\rho_2},$$

which is the formula used in determining the 'molecular weights' of gases. See MOLECULES—MOLECULAR WEIGHTS.

It can be shown, further, that the greatest possible value of γ , the ratio of the specific heats, is 1.67; but if the molecules are complex, so that there is internal energy in them, γ must be less. It is interesting to note that for helium, argon, and mercury vapor $\gamma = 1.67$, as found by direct experiment.

The properties of the pressure due to the atmosphere around the earth are discussed in the article ATMOSPHERE. Only a few points need be mentioned here. The pressure is measured by a barometer (q.v.) and is found to nearly equal that of 76 centimeters of mercury at sea-level and at 45° latitude, i.e. $76 \times 13.6 \times 980$ or 1,013,300 dynes per square centimeter. The barometer was invented by Torricelli, a pupil of Galileo; and the first instrument was made and used by Viviani in 1643. Pascal in 1648 showed that the height of the barometer varied with different heights above the earth, and proved that the pressure of the atmosphere obeyed the laws of liquid pressure. Von Guericke invented the air-pump (q.v.) in 1650, and without knowing of Torricelli's work discovered the properties of atmospheric pressure. He did not publish an account of his work, however, until 1672. Boyle published in 1660 an account of his experiments with an air-pump illustrating the properties of the pressure due to the air.

The action of lift-pumps, siphons, etc., depends upon atmospheric pressure. Air-pumps are instruments designed to exhaust the gas from a closed space such as a glass bulb.

Consult: Kimball, *Physical Properties of Gases* (Boston, 1890); Barus, *Laws of Gases*, "Scientific Memoir Series," vol. v. (New York, 1899); Randall, *Expansion of Gases*, "Scientific Memoir Series," vol. xv. (New York, 1901); Tait, *Properties of Matter* (Edinburgh, 1885); Meyer, *The Kinetic Theory of Gases* (London, 1899). See the articles DIFFUSION; EFFUSION; MATTER; AVOGADRO'S RULE; CHEMISTRY; SOLUTION. See also VAPOR.

GASES, LIQUEFACTION OF. See CRITICAL POINT; LIQUEFACTION OF GASES; REFRIGERATION.

GASKELL, Mrs. ELIZABETH CLEGHORN (1810-65). An English novelist, born in Chelsea, September 29, 1810, the daughter of William Stevenson. When she was only a few weeks old her mother died, and she was brought up by her aunt at Knutsford, in Cheshire—the village afterwards described in *Cranford*. She was sent to school at Stratford-on-Avon, where she learned Latin, French, and Italian. In 1832 she married Rev. William Gaskell, a Unitarian minister of Manchester. Her first novel, *Mary Barton*, appeared anonymously in 1848. It was followed by *Ruth* (1853); *Cranford* (1853); *North and South* (1855); *Lizzie Leigh* (1855); *Sylvia's Lovers* (1863); *Cousin Phillis* (1865); *Wives and Daughters* (1866); and many short tales. Mrs. Gaskell's usual aim was to combine instruction with pleasure. Her first novel and several others depict the habits, thoughts, privations, and struggles of the industrial poor, as she herself had observed them in Manchester. Her classic, however, is *Cranford*, which describes with de-

lightful humor a town given over wholly to spinsters. Mrs. Gaskell also wrote one of the very best biographies—*Life of Charlotte Brontë* (1857). She died November 12, 1865. Consult the article on Mrs. Gaskell in *Dictionary of National Biography*, vol. xxi. (London, 1890).

GASKELL, WALTER HOLBROOK (1847—). An English physiologist. He was born at Naples, Italy, was educated at Trinity College, Cambridge, studied medicine at University Hospital and Leipzig University, and in 1883 was appointed university lecturer in physiology at Cambridge. In 1889 he became fellow of Trinity Hall, and in the same year received the gold medal of the Royal Society for his investigations regarding the sympathetic nervous system. Several important articles from his pen on this subject have appeared in the *Journal of Physiology*. His name is identified with the theory that the central nervous system in vertebrates has resulted from the coalescence of the alimentary canal and the central nervous system of some crustacean-like ancestral form. In 1896 he was elected president of the physiological section of the British Association for the Advancement of Science.

GAS'OLINE. See PETROLEUM.

GASOMETER. See GAS, ILLUMINATING.

GASPARI, gá-spà'rè, GAETANO (1807-81). An Italian musician, composer, and musical historiographer, born at Bologna. He studied composition under B. Donelli, at the Liceo Musicale, which institution he entered in 1820 and was more or less connected with throughout his life. As a student, he won the first prize in composition (1827), and one year later was made honorary maestro. In 1840 he was appointed professor of solfeggio. The interval between 1828 and 1839 had been spent at Cento and Imola, where he resided as *maestro di cappella*. A tardy recognition of his talents secured for him in 1855 the appointment of librarian to the Liceo, as well as the chair of æsthetics. From 1857 to 1866 he held the important appointment of *maestro di cappella* at the Church of Saint Petronio. In 1866 he became a member of the royal deputation for historical research in the Romagna, and personally prepared the report on the musicians of Bologna. Already famous for his scholarly attainments, his work with the royal deputation increased his prestige, and led him to devote himself entirely to historical research. His compositions are comparatively unimportant, and were almost entirely written for the services of the Church. Of his many writings, the essay *Ricerche, documenti e memorie riguardanti la storia dell' arte musicale in Bologna* (1867) is among the most important. He died at Bologna.

GASPARI, gá-spà'ràn', AGÉNOR ETIENNE, Count de (1810-71). A French statesman and author, son of Count Adrien Etienne Pierre de Gasparin (1783-1862), born at Orange. In 1836 he entered the Cabinet of his father, then Minister of the Interior, as chief of a department, became master of requests in the Council of State in 1837, and in 1842 was elected to the Chamber of Deputies from Bastia in Corsica; but he failed of reelection in 1846, and put all of his enthusiasm into his written work. He wrote on the separation of Church and State, *Les intérêts généraux du protestantisme français* (1843), and *Christianisme et paganisme* (1846); on the abolition of slavery, *Esclavage*

et traite (1838); *Un grand peuple qui se relève* (1861); and *L'Amérique devant l'Europe* (1862); on the reform of home life, *La famille* (1865); *La liberté morale* (1863); *La conscience* (1872); and *L'ennemi de la famille* (1874); and in connection with the Franco-German War, *La déclaration de guerre, un protêt* (1870); *La république neutre d'Alsace* (1870); and *Appel au patriotisme et au bon sens* (1871). From 1849 until his death he lived at Geneva. Consult: Naville, *Le Comte Agénor de Gasparin* (Geneva, 1871); Borel under the same title (2d ed., Paris, 1870); Bar Fey-Boisier, *La Comtesse Agnes de Gasparin et sa famille; correspondance et souvenirs, 1813-1894* (2 vols., Paris, 1902).

GASPARI, VALÉRIE BOISSIER, Countess de (1813-94). A French woman of letters, born at Geneva. She was the wife of Agénor, Count de Gasparin (1810-71) (q.v.). She lived a great part of her life in the Canton Vaud, Switzerland, and was a prolific writer, mostly on religious and social topics. In addition to a number of translations of English and American authors, she published *Le mariage au point de vue chrétien* (1842), a work which won the Montyon prize from the French Academy; *Allons faire fortune à Paris* (1844); *Un livre pour les femmes mariées* (1845); *Il y a des pauvres à Paris et ailleurs* (1846), which won the Montyon prize of the Academy; *Quelques défauts des Chrétiens d'aujourd'hui* (1853); *Des corporations monastiques au sein du protestantisme* (1855); *Les horizons prochains* (1859); *Les horizons célestes* (1859); *Vesper* (1861); *Les tristesses humaines* (1863); and *La lèpre sociale* (1870).

GASPARINO DA BARZIZZA, gíl'spà-rè'nò dà bär-tsè'tsà (?-1431). An Italian humanist, born at Barzizza (Province of Bergamo). He taught successively at Venice and Padua, and in 1418 was called by Filippo Maria Visconti to Milan to establish a school there. Following the initiative of Petrarch, he placed great emphasis on the art of Latin epistolography, causing his scholars to imitate as nearly as might be the style of the letters of Cicero. This matter of polite letter-writing occupied an important place among the studies of Renaissance scholars, and *Epistolaria*, or 'guides to correspondence,' were prepared for the instruction of beginners. It is said that Gasparino intended to fill with conjectural material the numerous lacunæ existing in all manuscripts of the *De Oratore* then known, but was prevented by the discovery at Lodi (1419) of a complete manuscript, known as the *Codex Laudensis*, from which he then supplied the gaps. His complete works appeared at Rome in 1723.

GASPARY, gäs'pà-rè, ADOLF (1849-92). A German Romance philologist, born in Berlin. He studied there and at Munich and Freiburg, in 1879 was appointed lecturer in Romance languages at the University of Berlin, and in 1880 a professor at Breslau. In 1891 he accepted the appointment to a professorship at Göttingen, but owing to illness, never entered upon his duties there. He ranks among the foremost of recent Italian scholars in Germany. His most important work is his *Geschichte der italienischen Literatur* (vols. i. and ii., 1885-88; incomplete); *Die sizilianische Dichterschule des dreizehnten Jahrhunderts* (1878). Both of these have appeared

in Italian translations, the former at Turin in 1887-91, the latter at Leghorn in 1882.

GASPÉ, gäs'pä'. The most easterly district in the Province of Quebec, Can., consisting of the counties of Gaspé and Bonaventure, chiefly a peninsula projecting into the Gulf of Saint Lawrence, between the estuary of the same name on the north and the Bay of Chaleurs on the south (Map: Quebec, H 5). It consists of an elevated plateau traversed by the Schikshock or Notre Dame Mountains, ranging from 3500 to 3800 feet in height and terminating in Cape Gaspé, a bold headland of sandstone 690 feet high. Area, 7500 square miles. Population, in 1891, 47,700; in 1901, 52,200, the greater number of the inhabitants being of French descent. Lumbering and fishing are the chief occupations of the country.

GASPÉ. A village in the Province of Quebec, Can., which gives its name to the district (q.v.) and the bay on which it stands (Map: Quebec, J 5). It is the commercial centre of the extensive fishing industries of the region, and is a favorite summer resort for sportsmen attracted thither by fine angling and the varied scenery. The United States is represented by a consul and a vice-consul. It was here that Jacques Cartier landed in 1534, and took formal possession of the country for the King of France. It was the scene of the destruction of a French fleet in 1627; in 1760 it was captured by the English. Population, in 1891, 307; in 1901, 454.

GASPÉ, PHILIP IGNATIUS (1714-87). A French-Canadian soldier. He accompanied De Longueuil on the expedition against the Chicacha and Natchez Indians (1739), and subsequently led troops from Mackinac in attacks on the English colonists. In 1750-52 he was in command of a fort on the Saint John River, and in 1758 led the Canadian militia in the defense of Fort Carillon (better known under its English name of Ticonderoga), when 3600 troops under Montcalm repulsed an English army about four times as numerous under Abercromby. After the surrender of Quebec in 1759, he commanded the grenadiers of De Lévis.

GASPEREAU, gäs'pär-ö (Fr.). The alewife; so called in Eastern Canada.

GASS, gäs, WILHELM (1813-89). A German Protestant theologian, born in Breslau. He studied at Breslau, Halle, and Berlin, became a lecturer in theology at Breslau in 1839, and in 1846 was appointed professor. Subsequently he was professor at Greifswald from 1847 to 1861, at Giessen in 1861-68, and from 1868 at Heidelberg. His chief work is *Geschichte der protestantischen Dogmatik* (4 vols., 1854-67). His other publications include: *Gennadius und Pletho, Aristotelismus und Platonismus in der griechischen Kirche* (1844); *Die Mystik des Nikolaus Kavalas vom Leben in Christo* (1849); and *Geschichte der christlichen Ethik* (2 vols., 1881-87). He was an associate editor of the *Zeitschrift für Kirchengeschichte*, and of the *Theologischer Jahresbericht*.

GASSENDI, gäs'sän'dé', or **GASSEND**, gäs'sän', PIERRE (1592-1655). An eminent French philosopher and mathematician. He was born at Champcerier, a little village of Provence, in the Department of Basses-Alpes. His unusual powers of mind showed themselves at an early

age; and at the age of sixteen he became instructor of rhetoric, then professor of theology, at Aix, and in 1616 professor of philosophy. He meanwhile applied himself with zeal to the study of the natural sciences that were taught in his day, and was especially interested in astronomy and anatomy. In philosophy he became disgusted with scholasticism and undertook to maintain certain theses against the Aristotelians. His polemic appeared at Grenoble in 1624, and was entitled *Exercitationes Paradoxicæ adversus Aristoteleos*. He drew a distinction between the Church and the scholastic philosophy, denying that the former must stand or fall by the latter. In 1623 he was appointed provost of the cathedral at Digne, an office which enabled him to pursue without distraction his astronomical and philosophical studies. At the recommendation of the Archbishop of Lyons, a brother of Cardinal Richelieu, Gassendi was appointed in 1645 professor of mathematics in the Collège Royal de France, at Paris, where he died, October 14, 1655. As a philosopher, Gassendi revived and maintained, with great learning and ingenuity, the doctrines of Epicurus, as he found the atomistic philosophy most easily brought into harmony with his own scientific acquirements and modes of thought. His Epicureanism, however, was not allowed to interfere with his loyalty to the Catholic faith. He reconciled the two views by holding that God is the First Cause, who created matter in the form of atoms, and endowed these with motion, which thus becomes their indefeatable characteristic. His great philosophical opponent was Descartes (q.v.). His philosophy was in such repute that the savants of that time were divided into Cartesianes and Gassendists. The two chiefs themselves always entertained the highest respect for each other, and were at one time on the friendliest terms. Gassendi ranked Kepler and Galileo among his friends, and was himself the instructor of Molière. His principal work is entitled *De Vita, Moribus, et Placitis Epicuri* (1641), to which the *Syntagma Philosophiæ Epicuri* (1649) properly belongs. It contains a complete view of the system of Epicurus. His *Institutio Astronomica* (1645) is a clear and connected representation of the state of the science in his own day; in a later work he gave the biography of Tycho Brahe, Copernicus, and other astronomers, and a history of astronomy down to his own time. His works were collected and published in six volumes, at Leyden (1658), and at Florence (1728). Consult: Thomas, *La philosophie de Gassendi* (Paris, 1889); Martin, *Histoire de la vie et des écrits de Gassendi* (Paris, 1853); Kiefl, *Gassendie Erkenntnistheorie und seine Stellung zum Materialismus* (Fulda, 1893).

GASSER, gäs'ër, HANS (1817-68). An Austrian sculptor, born at Eisentratten, Carinthia. He studied in Vienna under Amerling, Klieber, and Kühssmann, and afterwards in Munich with Schwanthaler. His works include the statue of Adam Smith at Oxford, allegorical statues for the arsenal and other public buildings of Vienna, and the monuments to Wieland at Weimar, and Maria Theresa at Klagenfurt and Wiener-Neustadt. One of his best works is the "Donauweibchen" in the Vienna Stadtpark.

GASSER VON VALHORN, gäs'sër fön fäl'hörn. JOSEPH (1816-1900). An Austrian sculp-

tor, brother of Hans Gasser, born at Prägraten, Tyrol. First instructed by his father, a joiner and wood-carver, he studied afterwards at the Vienna Academy under Schaller, Klieber, and Kähssmann, and from 1845 to 1849 in Rome, whither he had gone with a Government stipend. After his return he executed for the portal of the Cathedral of Speier five statues of heroic size, representing "The Holy Virgin;" "Archangel Michael;" "John the Baptist;" "Saint Stephen;" and "Bernard of Clairvaux." Among the numerous works intrusted to him subsequently in Vienna, where he had settled in 1852, are to be noted the statues of Emperor Maximilian I., Frederick the Warlike, and Leopold of Hapsburg, in the Arsenal; the marble statues of the "Seven Liberal Arts," in the staircase of the opera house; twenty-four statues in Saint Stephen's Cathedral; and especially the sculptures for the Votivkirche, including the "Coronation of Mary," "Group of the Trinity," "Statue of the Redeemer," and the large bas-reliefs on the three main portals. He was professor at the Academy from 1865 to 1873, and a title of nobility was conferred on him in 1879.

GASSION, gá'syôn', JEAN DE (1609-47). A French general, born at Pau. He fought under the Prince of Piedmont in 1625, and under the Duke de Rohan in 1628. In 1629 he joined a troop of French volunteers and entered the service of Gustavus Adolphus. With him he fought at Leipzig (1631), and saved his life afterwards at the siege of Ingolstadt. As a reward the King gave him command of a regiment. He further distinguished himself at Nuremberg and Lützen. After the King's death he returned to France and fought bravely in the battles of Charmes and Neuchâtel, and at the sieges of Dôle, Hesdin, and Landrecies. In 1638 he was made *maréchal-de-camp* and materially assisted in the French victory of Rocroi (1643). He received the baton of a marshal of France in 1643. Four years afterwards he died from the effects of a wound received under the walls of Lens.

GASSNER, gäs'nër, JOHANN JOSEPH (1727-79). A priest who gained renown as an exorcist. He was born at Bratz, near Bludenz, in the Tyrol, and became a Catholic priest at Klösterle, in the diocese of Chur (1758). The accounts of demoniacs in the New Testament, with the writings of celebrated magicians, brought him to the conviction that most diseases are attributable to evil spirits, whose power can be destroyed only by conjuration and prayer. He began to practice on some of his parishioners, and succeeded in at least attracting notice. The Bishop of Constance called him to his residence, but having come to the conviction that he was a charlatan, advised him to return to his parsonage. Gassner betook himself, however, to other prelates of the Empire, some of whom believed that his cures were miraculous, and he gained influential supporters, although innumerable attacks were made upon his methods and the genuineness of his cures. Consult his life by Zimmermann (Kempten, 1787).

GAST, gäst, FREDERICK AUGUSTUS (1835—). An American clergyman of the Reformed Church in the United States, born at Lancaster, Pa. He graduated in 1856 at Franklin and Marshall College (Lancaster), studied at the Mercersburg Theological Seminary (now at Lancaster), and in '859-65 was pastor at New Holland, Pa. In

1865 he was chaplain of the Forty-fifth Pennsylvania Volunteers, in 1865-67 pastor at London and Saint Thomas, Pa., and in 1867-71 principal of the academy connected with Franklin and Marshall College. In 1871 and 1872 he was assistant professor in the college, from 1871 to 1873 a tutor in the Lancaster Theological Seminary, and in 1873 was appointed professor of Hebrew and Old Testament theology in the latter institution. His articles upon the Old Testament and allied subjects have been published in theological periodicals.

GASTEIN, gä'stîn. A valley in the Austrian Duchy of Salzburg, celebrated for its mineral springs. It is a side valley of the upper Salzach Valley, and is about 25 miles long and one and one-quarter miles broad, with an elevation of between 3000 and 3500 feet. It is traversed by the River Ache, which forms near Wildbad-Gastein two magnificent waterfalls, the upper, the Kesselfall, 200 feet, and the lower, the Bärenfall, 280 feet in height. The principal villages are Bockstein, Hof-Gastein, and Wildbad-Gastein. Hof-Gastein, with a number of old gold and silver mines in the vicinity, contains a military hospital, and in the open platz there is a bust of the Emperor Francis I., who in 1828 caused a conduit of upward of five miles in length to be constructed for the purpose of conveying the mineral waters thither from Wildbad. Wildbad, the principal watering-place, is a fashionable health resort, and contains a number of hotels and villas. The water of the springs is considered efficacious in the case of nervous and skin diseases.

GASTEIN, CONVENTION OF. A treaty concluded at Wildbad-Gastein, August 14, 1865, between Austria and Prussia, regulating the relations of these two powers with respect to the duchies of Schleswig-Holstein (q.v.) and Lauenburg, which they had taken from Denmark, and occupied in common. Schleswig was placed under Prussian administration, and Holstein under Austrian, while Lauenburg was annexed to Prussia. Austria ceding its share for 2,500,000 rix thalers. See GERMANY.

GASTEROMYCETES (Neo-Lat. nom. pl., from Gk. γαστήρ, *gastēr*, stomach + μύκης, *mykēs*, mushroom). The group of fungi that includes the puffballs. See BASIDIOMYCETES.

GASTINE, gä'stên', CIVIQUE (1793-1822). A West Indian reformer and author, born at Fort de France in the island of Martinique. In 1809 he began the study of law at Philadelphia, Pa., but, owing to views expressed in a public address regarding equality between whites and blacks, was obliged, in 1813, to make his escape to Paris. There he began, in 1815, to publish a journal called *L'Ami du Noir*, whose utterances frequently subjected him to imprisonment or fines. Finally, upon the publication of his *De la nécessité de faire un traité de commerce avec Haïti* (1821), he was banished. He proceeded to Hayti, where he was granted an annual pension of 5090 francs, and appointed Secretary of Foreign Relations. His further publications include an *Histoire de la république de Haïti* (1819), and an *Histoire de l'esclavage dans la Louisiane* (1820).

GASTINEAU, gä'stê'nô', BENJAMIN (1823—). A French author, born at Montreuil-Bellay. He was at first a printer, but afterwards became

a writer, and first attracted attention by a series of articles in *L'Ami du Peuple* in 1851, which led to his arrest and deportation to Algeria. He returned to France in 1854, but his connection with the *Guetteur de Saint-Quentin*, which he edited in 1856-58, brought upon him the displeasure of the Government, and he was again deported. After several years' absence he was again in France, and after the insurrection of March, 1871, was placed in charge of the Mazarin Library by the Communists. For this he was in the following year again sentenced to deportation (in his absence), but returned to France after the general amnesty. In addition to frequent contributions to the reviews, he published a large number of books, mostly of a political or historical nature, of which the most important are: *Lutte du catholicisme et de la philosophie* (1844); *Le bonheur sur terre* (1844); *La guerre des Jésuites* (1845); *L'orpheline de Waterloo* (1847); *Le régime de Satan, ou les riches et les pauvres* (1848); *Les femmes et les mœurs de l'Algérie* (1852); *Histoire de la folie humaine* (1862); *Les femmes des Césars* (1863); *Les génies de la liberté* (1865); *Les socialistes* (1865); *Les drames du mariage* (1865); *Les victimes d'Isabelle II.* (1868); *L'impératrice du Bas-Empire* (1870); *Le centenaire de Voltaire* (1878); *Les femmes et les prêtres* (1888); and *Les crimes des pêtres de l'église*.

GASTINEL, gâ'sténél', LÉON (1823-). A French composer, born at Dijon. He was a pupil of Halévy, and won the Prix de Rome for his cantata *Vélasquez* (1846). His operas include: *Le miroir* (1853); *L'opéra aux fenêtres* (1857); *Titus et Bérénice* (1860); and *Le buisson vert* (1861); and the oratorios, *Le dernier jour* (1853); *Les sept paroles*; *Saul*; *La fée des eaux*. He also wrote a cantata *Mexico* (1863), and several masses, symphonies, and overtures, besides chamber music and songs.

GASTON, gâ'stôn', MARIE. The nom-de-plume with which Alphonse Daudet signed the *Lettres de mon Moulin* (1866).

GASTON, WILLIAM (1778-1844). An American orator and jurist, born in Newbern, N. C., of French Huguenot descent. He graduated at Princeton in 1796, was admitted to the bar in 1798, and in the following year was elected to the North Carolina Senate. He was a Presidential elector in 1808, and from 1813 to 1817 was a Federalist member of Congress, where he achieved a reputation as an orator by an able speech in opposition to the Loan Bill in 1815. After his retirement from Congress he engaged actively in law practice, and added to his reputation as one of the most eloquent orators in the South. He was elected frequently to the North Carolina Legislature, where he was the framer of the act establishing the present Supreme Court of the State. After the disappearance of the Federal Party he became a Whig, and zealously opposed the South Carolina nullification doctrine. He served as a judge of the Supreme Court of North Carolina from 1834 until his death.

GASTON III., COMTE DE FOIX. See FOIX.

GASTON DE FOIX, de fwā, DUC DE NE-MOURS. See FOIX.

GASTORNIS (from *Gast-on* Planté, the discoverer of the bird + Gk. *δρυς*, *ornis*, bird). A genus, or perhaps a family (Gastornithidæ), of

extinct gigantic birds, larger than and related to the ostriches, whose bones are found in the Lower Eocene of France and England, and which is represented in coeval formations in the United States by the genus *Diatryma*. "In the European gastornis the component bones of the skull remained separate throughout life, and . . . there may have been a tooth on each side of the upper jaw." See BRONTORNIS.

GASTRÆA THEORY (Neo-Lat., from Gk. γαστήρ, *gastēr*, stomach). A theory propounded by E. Haeckel, according to which the gastrula stage in the development of animals (see EMBRYOLOGY) is a recapitulation of a hypothetical common ancestor—the gastræa; for just as the two-layered gastrula stage, although sometimes disguised by the presence of much yolk, is common in the embryological development of the Metazoa, so in their phylogenetic development there was a primitive type that was the starting-point from which all the various metazoan types have developed along diverging lines. The gastrula is the type which seems to be the common one in the embryological development of the Metazoa. The hypothetical phylogenetic type, the starting-point of the Metazoa, Haeckel named 'gastræa.' The Gastræidæ were supposed to be of world-wide distribution, and of many families and genera. The outer and inner layers of the gastrula and the gastræa Haeckel homologized with the ectoderm and endoderm of the Metazoa. This theory, however, should not be wholly ascribed to Haeckel, for the homologies of the germ-layers had already been pointed out by Kowalewsky, Von Baer, Remak, and others. Kowalewsky concluded from his embryological researches that the nervous layers and the ectoderm of insects and vertebrates are homologous, and that the germinal layers of Amphioxus and vertebrates correspond with those of ascidians and worms. Kowalewsky, indeed, believed "that the homologies of the general layers in the different types afford a scientific basis for comparative anatomy and embryology, and must be recognized as the starting-point for the proper understanding of the relationships of the types." The generalizations of Haeckel, although based largely on such work as Kowalewsky's, are much bolder than those just quoted.

The simplest and probably the most primitive gastrula seen in vertebrate development is that of Amphioxus. The blastula, or stage that is antecedent to the gastrula in Amphioxus, is composed of a single layer of cylindrical cells closely joined in the shape of a hollow sphere. At one place in this sphere, called the vegetative pole, the cells are larger and contain more yolk-granules than the cells of the rest of the circumference. The vegetative surface begins to flatten and then to push toward the inside of the sphere. This inpushing is termed 'invagination.' As the cavity formed by invagination grows larger, the original cleavage cavity in the sphere grows smaller, until finally it is wholly obliterated. The resulting individual is two-layered and cup-shaped with one large opening to the exterior, the primitive mouth or blastopore. This double-layered, cup-shaped individual is the gastrula, and its inner cavity is the primitive intestine. Neither this mouth nor the intestine is homologous with the mouth or the intestine of the adult animal. The two primary germ-layers of

the gastrula are known as ectoderm and entoderm. The outer or ectoderm is the sensitive layer, and the inner is the nutritive layer. C. E. von Baer calls them, in view of their function, the two primitive organs of the animal body. By the separation and differentiation of cells from one or the other, or both of these layers, all subsequent development and differentiation of the body is brought about. Embryonic stages quite like this of the *Amphioxus* are known to exist in the *Cœlenterata*, some *Scolecida*, *Echinodermata*, and some *Annelida*, in addition to those of the higher vertebrates.

As Huxley has pointed out, the *Porifera* and *Cœlenterata* very nearly approach the conditions of the gastræa. The fresh-water hydra and the microhydra, for example, are two-layered animals with a central digestive cavity surrounded by both layers and opening to the exterior at a point about the margins of which the two layers are continuous. This permanent mouth is the terminal aperture of the gastræa and serves both for the ingestion and extrusion of materials, while in the *Porifera* it serves as the permanent egestive opening only. Consult: Hæckel, "Die Gastræatheorie, die phylogenetische Classification des Thierreichs und die Homologie der Keimblätter" (Jena, 1874); "Die Gastrula und die Eifurchung der Thiere" (Jena, 1875); "Ursprung und Entwicklung der thierischen Gewebe: Ein histogenetischer Beitrag zur Gastræatheorie," (Jena, 1885), all published in *Zeitschrift für Tiermedizin*; Kowalewsky, "Weitere Studien über die Entwicklungsgeschichte des *Amphioxus lanceolatus*, nebst einem Beitrage zur Homologie des Nervensystems der Würmer und Wirbelthiere," in *Archiv für Mikroskopische Anatomie*, vol. xiii. (Bonn, 1877); Bütschli, "Bemerkungen zur Gastræatheorie," in *Morphologisches Jahrbuch*, vol. ix. (Leipzig, 1884).

GASTRAL/GIA, or **GASTRODYN'IA**. See **INDIGESTION**.

GASTRIC FEVER. See **TYPHOID FEVER**.

GASTRIC JUICE. See **DIGESTION**, **ORGANS OF**; **FOOD**; **GASTRITIS**.

GASTRITIS (Neo-Lat., from Gk. *γαστήρ*, *gastēr*, stomach). A disease in which the mucous membrane of the stomach is the seat of disordered action accompanied by inflammation. Acute gastritis may be of three forms: (1) *Acute catarrhal gastritis*, in which there is a feeling of fullness, production of gas in the stomach, nausea, slight pain, severe headache, often rise of temperature, possibly vomiting, diarrhœa or constipation, with furred tongue. It is caused by errors in diet, such as excessive quantities of food, ice-cold drinks, spiced or fermented food, or alcoholic beverages. It is very common, and, except in the aged, has a favorable prognosis. Emptying the stomach by washing with a tube or pump is good treatment in some instances. Some aperient is generally very desirable, and the stomach should be rested for about three days. (2) *Toxic gastritis* is caused by alcohol, phosphorus, arsenic, corrosive sublimate, chlorate of potash, mineral acids, caustic alkalies, etc. The symptoms are as given for acute catarrhal gastritis with vomiting of blood, torturing thirst, small pulse, cyanosis, cold perspiration, and even coma and death in grave cases. The treatment consists in antidoting the poison taken, and in

some cases washing the stomach. (3) *Purulent or phlegmonous gastritis*, in which variety small abscesses form in the submucous or muscular layer of the stomach walls. After dyspeptic symptoms for several days, burning pain, thirst, revulsion against food, fever reaching 103° to 105° F., small, irregular pulse, vomiting of mucus and bile, and generally diarrhœa follow. Death generally supervenes in from four days to two weeks.

In *chronic gastritis* the symptoms are as in the acute catarrhal form, persisting permanently, with constipation alternating with diarrhœa, pyrosis, scanty urine, cold hands and feet, coated tongue. There is generally a decrease in the secretion of gastric juice, and low acidity, as learned from a test meal. Diet and hygiene, occasional lavage, intragastric electrization, certain mineral waters, and very little drugging, help many cases to enjoy life for years.

PATHOLOGY. In acute catarrhal gastritis, the mucous membrane of the stomach is swollen and red, and coated with an increased amount of mucus, although the secretion of gastric juice is less than normal. The cells of the mucous membrane, both mucous and peptic, are swollen and granular, and there may be considerable infiltration of the intertubular tissue with serum and leucocytes. In the acute gastritis due to the taking of irritant poisons such as strong acids, caustic alkalies, corrosive sublimate, etc., the changes in the stomach are directly proportioned to the quantity and strength of the poison taken. Thus, strong acid in large quantities may not only destroy the entire mucous membrane of the stomach, but may cause extensive destruction of the deeper coats, even causing perforation. Smaller quantities destroy portions of the mucous membrane and underlying tissue, with consequent sloughing and cicatrization. In chronic gastritis the stomach may be of normal size, small, or enlarged. The mucous membrane may be thickened, or thinner than normal, and is usually coated with thick tenacious mucus. It may be red and congested, or of a dull gray color. There are atrophy of the gastric tubules and an increase in the tubular connective tissue. The stomach walls are sometimes greatly thickened from the formation of new fibrous tissue, and the capacity of the organ is thus greatly diminished. A form of gastritis characterized by the formation of a false membrane is known as croupous, membranous, or diphtheritic gastritis. In connection with suppurative processes in other parts of the body, there may be suppuration with abscess formation in the walls of the stomach, this condition constituting what is known as suppurative or purulent gastritis.

GASTROCHÆNA, *gāstrō-kē'nā* (Neo-Lat., from Gk. *γαστήρ*, *gastēr*, stomach + *χάλυξ*, *chalkein*, to gape). A genus of lamellibranchiate mollusks, having a delicate shell of two equal valves, gaping very much in front. The animal sometimes takes possession of an already existing cavity, which it often coats with a calcareous lining, so as to form a tube, to which the valves of its shell are cemented; sometimes burrows for itself in sand, coral, or calcareous rocks, and lines its hole with a shelly layer. One species (*Gastrochæna modiolina*), common in the Mediterranean, perforates shells and limestone, making holes about two inches deep and half an inch in diameter. The tubes of some of the tropical species

which live in sand are very curious. See WATER-ING-POT SHELL.

GASTROCNEMIUS, gās'trōk-nē'mī-ūs, **MUSCLE** (Neo-Lat. from Gk. γαστροκνήμη, *gastroknēmia*, calf of the leg, from γαστήρ, *gastēr*, stomach + κνήμη, *knēmē*, knee). The muscle which forms the greater part of the calf of the leg. It arises by two heads from the two condyles of the femur or thigh-bone, and is inserted through the tendo Achillis into the posterior part of the heel-bone. In man this muscle possesses great power, and is constantly called into use in standing, walking, leaping, etc. In walking it raises the heel, and with it the entire body from the ground; and, the body being thus supported on the raised foot, the other leg is carried forward. From its close association with the erect position, it is much less developed in other mammals than in the human subject.

GASTRO-ENTERITIS (Neo-Lat., from Gk. γαστήρ, *gastēr*, stomach + ἔντερον, *enteron*, intestine). An inflammatory disease of the stomach and small intestine resulting in disordered function, vomiting, and diarrhœa. In children the disease is called cholera infantum (q.v.). It is the 'summer diarrhœa' which proves fatal to so many infants fed on cow's milk from unclean bottles. In children it is ushered in by slight fever, fretfulness, diarrhœa, coated tongue, and loss of appetite. In a few days the diarrhœa becomes worse, the stools are thin, green, yellow, or brown, and contain undigested food and mucus, and their odor is very offensive. The infant becomes pale, and rapidly emaciates. It may improve from this point and recover in a week; or it may suddenly suffer from a rise of temperature to 103° or 105° F., cry much, evince great thirst, and exhibit a weak pulse. Stupor, sunken eyes, general relaxation, and even convulsions may follow. Vomiting supervenes on taking any food or water, and death results from exhaustion. The treatment includes: change of air to a cooler climate, or an excursion into the country, or on the salt water three times a week; out-of-door life, in hammock or carriage, sponge bathing to allay restlessness and fever, scrupulous cleanliness, withholding all food for twelve to twenty-four hours, allaying thirst with small quantities of barley water, followed by nursing every four hours, for two or three minutes at a time, washing out the stomach once, in the worst cases, and irrigation of the large intestine by means of a tube, after giving a laxative, repeating the irrigation two or three times a day. A saline solution of one ounce to the gallon, at 80° F., is preferable. Subgallate or subnitrate of bismuth, calomel, salicylate of sodium, salol, hydrochloric acid, opium with great care in selected cases, and stimulants, all have their value.

Gastro-enteritis of adults is discussed under CHOLERA. See also ENTERITIS.

GASTRO-ENTERITIS (in cattle). The chief symptoms of this disease in cattle are dullness, dry skin, fullness of the left flank, and staring coat—the hair standing on end. The pulse is weak, the gait staggering, and the bowels constipated. The animal grunts with each breath, especially when lying down, and dies in convulsions. The more common causes of the trouble are too long intervals between feeding, sudden

changes of diet, sudden checking of perspiration, and violent exercise immediately after eating.

When the disease is supposed to originate from imperfectly digested food, one pint of castor-oil should be given, followed by liberal doses of linseed tea, to which carbonate of magnesia has been added. This may be administered three or four times daily along with ten drops of tincture of aconite.

GASTROMANCY. See SUPERSTITION.

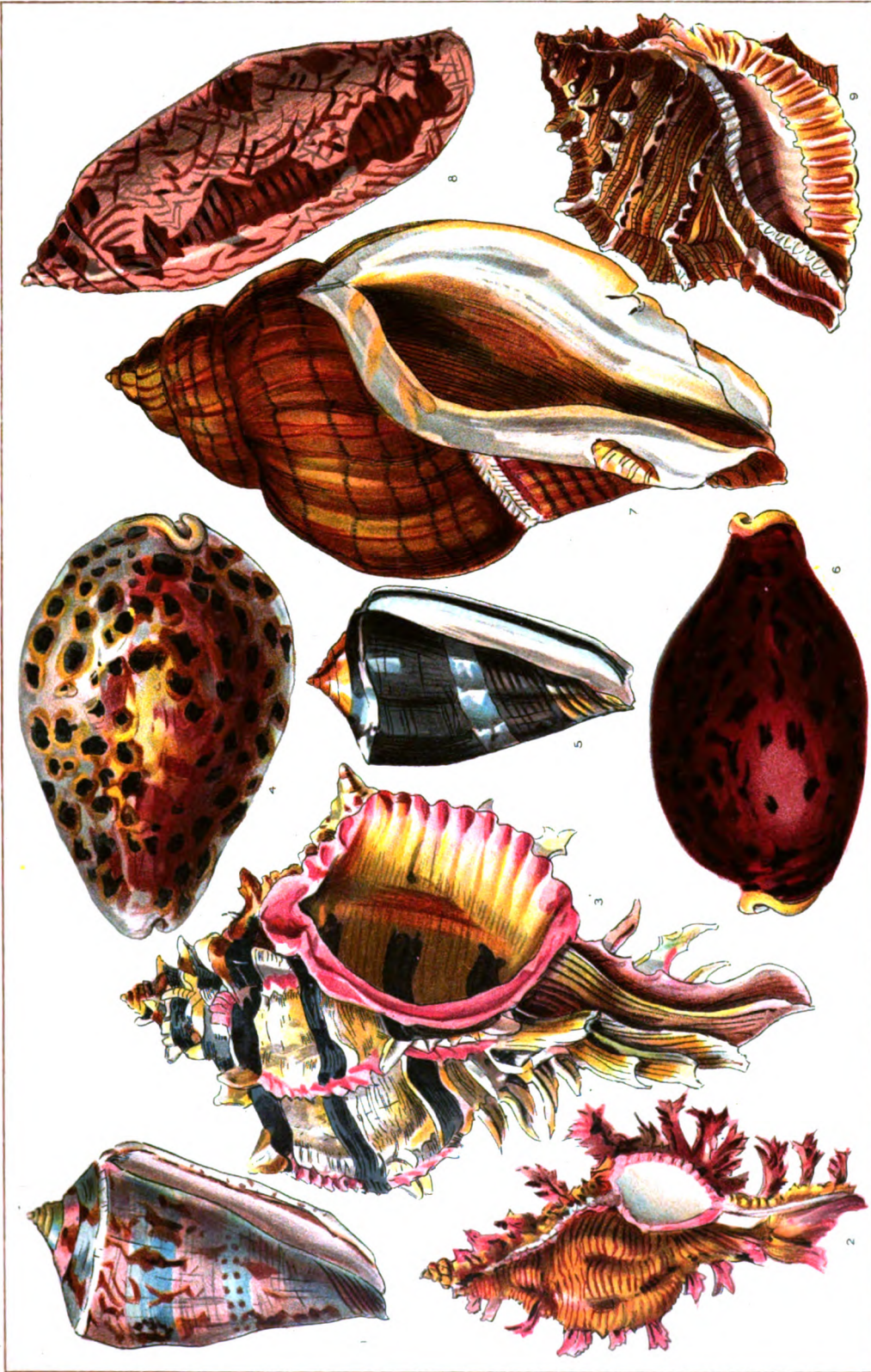
GASTROPODA (Neo-Lat. nom. pl., from Gk. γαστήρ, *gastēr*, stomach + πούς, *pous*, foot). A class of mollusks characterized by having a distinct head, usually bearing eyes and tentacles, and moving by a large creeping disk or 'foot.' The head and foot are bilateral, but the rest of the body (except in Patella, etc.) is unsymmetrical. The animal is usually protected by a single or univalve shell, which is more or less spirally coiled, inclosing the visceral mass, i.e. heart, stomach, liver, and reproductive glands. Moreover, these mollusks have, besides two pharyngeal horny teeth, a rasp-like lingual ribbon (radula) forming a part of the odontophore situated in the mouth or buccal cavity. There are, in the typical forms, two plume-like gills (ctenidia) inclosed in a mantle-cavity, but there may be only one, while in the air-breathing forms (Pulmonata, or land-snails) the animal breathes the air through the wall of the mantle-cavity itself, which forms the pulmonary sac or lung. The 'foot' is a broad creeping disk, situated behind the head, and it is usually seen from beneath to be broad and flat. See illustration under FIG-SHELL.

STRUCTURE. A heart contained in its pericardial sac is always present, except in the parasitic Entoconcha, while in some genera, as Neritina (periwinkle) and Haliotis (abalone), it, as in the clam, is perforated by the intestine. In a few genera there are two auricles to the heart, but as a rule only one is present. A ventricle is always present. There is but a single kidney (nephridium). The digestive canal is doubled on itself, the vent opening on one side of the mouth. In certain opisthobranchs the stomach is lined with series of teeth, sometimes sharp and chitinous. In some nudibranch gastropods (see NUDIBRANCHIATA) the intestine has numerous lateral offshoots, or gastro-hepatic branches, which resemble similar structures in the planarian and nematode worms.

The nervous system varies in the number of ganglia, but is usually represented by the 'brain,' a pair of supraœsophageal ganglia, with connecting threads (commissures) passing around the gullet to the infraœsophageal or pedal ganglia, thus forming the œsophageal nerve-ring; there are also a pair of buccal ganglia, while the visceral and abdominal ganglia, all connected by commissures, are situated at a varying distance from the head. The ears, or 'otocysts,' are usually near the pedal ganglia, but are always innervated from the cerebral ganglion, or 'brain.'

The animal in certain forms is bisexual or hermaphroditic, in others the sexual glands exist in separate individuals. The eggs are laid in capsules of various sizes and shapes, usually attached to seaweeds or rocks, or deposited freely in the sand. Land-snails lay their eggs loose under stones or leaves in damp places. The embryo on hatching passes through a well-marked metamorphosis,

MARINE GASTROPODS



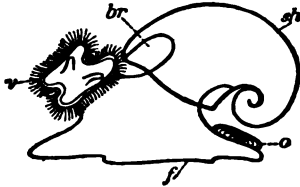
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JULIUS BIEN & CO. LITH. N.Y.

- 1 PURPLE CONE - CONUS PURPURASCENS
 - 2 SAUL'S MUREX - MUREX SAULÆ
 - 3 MUREX BRASSICA
 - 4 TIGER COWRY - CYPRAEA TIGRIS
 - 5 ROYAL CONE - CONUS REGALITATUS
 - 6 PANTHER COWRY - CYPRAEA PANTHERINA
 - 7 MONOCEROS GIGANTEUM
 - 8 CONUS AURATUS
 - 9 RANELLA CRUMENA
- NATURAL SIZE

the two more important stages being the trochosphere and veliger, the latter differing from the trochosphere or top-shaped primitive stage in swimming about by means of a pair of sail-like flaps.

Soon after the shell of a gastropod begins to form, the foot grows larger, the eyes and tentacles appear, when the young sinks by gravity to the bottom and gradually assumes the snail condition of maturity. The eyes may be absent



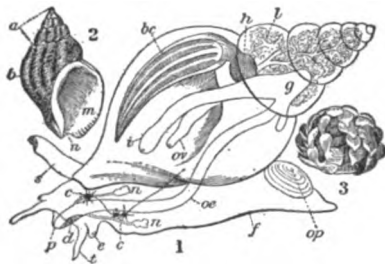
A YOUNG GASTROPOD.

'Veliger' stage: v, velum; f, foot; o, operculum; br, gill-chamber; sh, primitive shell.

in those marine forms which actively burrow in the sand, though the single pair of tentacles persists. In the land-snails there are two pairs of tentacles, the upper and longer pair containing both the eyes and the optic nerve with the olfactory nerve, which ends in groups of cells.

A distinctive feature in gastropods is the 'odontophore,' an apparatus of muscles bearing the radula or 'lingual ribbon,' a solid flattened ribbon-like or rasp-like plate armed with transverse rows of sharp siliceous teeth. This rasp is drawn back and forth over a tendon like a pulley. By means of this rasp the land or pond snail cuts slits into leaves, swallowing the pieces, or the marine forms, such as the *Sycotypus* (see COXCH) or the 'drill,' files a hole into the clam or oyster, so as to get at the flesh within the tightly closed shell of its victim.

Certain forms, as the *Murex* (q.v.) of the Mediterranean, secrete the Tyrian dye of the ancients, and a similar fluid is secreted by the com-



STRUCTURE OF A GASTROPOD.

1. Diagram of the structure of a gastropod (the common whelk). f, muscular 'foot'; op, operculum; t, one of the tentacles or feelers; e, eye-stalk, at the base of the tentacle; p, proboscis, retracted, with the mouth at its extremity; oe, gullet; g, stomach; l, intestine, terminating in the anus; n, n, salivary glands; l, liver and ovary; ov, oviduct; h, heart; bc, gill, contained in a hood of the mantle; s, breathing-tube or siphon; c, c, main nerve-ganglia. 2. Shell, with animal removed; a, spire whorls, separated by sutures; b, body whorl; m, outer lip of 'mouth'; n, notch for the siphon at the base of columella. 3. Egg-capsules of the whelk.

mon *Purpura* of our coast. This fluid is formed in a peculiar 'adrectal gland' situated at the side of the rectum. It is colorless, but turns purple on exposure to the air.

The shell of different gastropods varies greatly in shape. In the limpets (*Patella*) it is low and conical; in most of the species it is spiral, made up of whorls. The greater number of shells are 'dextral,' i.e. the spire turns to the right; in a few cases they are sinistral or turn to the left.

Over 22,000 species are known, of which about 7000 species are fossil; there are about 6500 species of land-snails alone.

CLASSIFICATION. Gastropods are divided into two subclasses: (1) Streptoneura, "in which the visceral commissures are twisted into a figure of 8, and in which the sexes are distinct;" and (2) Euthyneura, in which the visceral commissures are not so twisted, and in which the sexes are united. The former contains the order Aspidobranchia, which includes the limpets, ear-shells, top-shells, turban-shells, etc.; and the order Pectinibranchia, which contains the bulk of the other marine shell-bearing forms. The latter subclass also has two orders: Opisthobranchia, containing the sea-hares (*Aplysia*), pelagic pteropods, etc.; and Pulmonata, containing the land and fresh-water air-breathing snails and slugs.

FOSSIL GASTROPODS. Gastropod shells are found in all the geological formations from those of lowest Cambrian age to those of recent time, and they occur usually in abundance in those formations above the Cambrian. The earliest forms are limpet-like shells (*Scenella*) and a capulid (*Stenotheca*) in the *Olenellus* zone of the Lower Cambrian system. Very soon, in the Upper Cambrian a few turreted gastropods appear (*Raphistoma* and *Straparollina*). These true gastropods are in the Cambrian associated with a host of slender conical shells, the hyolithids, which are often classed with the pteropods, but which should more properly be placed with the tubicolous worms.

In the Ordovician the gastropods are widely differentiated and are represented by numerous genera and abundant individuals, with such well-known forms as *Pleurotomaria*, *Bellerophon*, *Raphistoma*, *Murchisonia*, *Maclurea*, *Euomphalus*, and others. In the Silurian a further evolution has taken place, manifested principally in the increased ornamentation of genera that come up from the Ordovician, and in the creation of new genera from those already existing. Some of the important forms are *Loxonema*, *Murchisonia*, *Platyostoma*, *Pleurotomaria*, *Bucania*, *Trematonotus*, *Euomphalus*. The Devonian formations are still richer in species and are characterized by such forms as *Loxonema*, *Turbo*, *Euomphalus*, *Platyostoma*, *Platyceras*, *Acroculia*, *Macrocheilus*. In the Carboniferous the same genera are present with the addition of *Naticopsis*, *Vermetus*, and *Actæonina*. The Permian gastropod fauna is about the same as that of the Carboniferous. The majority of the Paleozoic gastropods belong to the more primitive, less specialized subclass of the Streptoneura, and especially to the order Aspidobranchia, and it is worthy of note also that the Paleozoic genera are as a rule holostomatous, i.e. they have shells with non-siphonate apertures.

The Triassic formations at the beginning of the Mesozoic show important changes in the gastropod fauna. The Paleozoic pteropods have dropped out; the *Bellerophon*idae, the Devonian *Platyceridae* and *Platyostomidae* have disappeared,

and the euomphalids have become less abundant, and a new type of shell, the siphonostomatous, appears with the families Cerithiidae and Melaniidae, in which the siphon is, however, shorter than in the later members of these families. The important genera are Chemnitzia, Loxonema, Rissoa, Eulima, Trochus, Turbo, Pleurotomaria, Cerithium, Helcion. In the Jurassic the Valvatidae, Viviparidae, Melaniidae, Aporrhaidae, Strombidae, Columbelloidae, Cypræidae begin their existence and the fauna is strongly siphonostomatous. One Jurassic family, the Nerineidae, which began in the Trias and continued into the Cretaceous, is a very characteristic Mesozoic shell, that may be recognized by its slender turreted spire, resembling that of its allies the Cerithiidae, and by the peculiar longitudinal septa that project from the columella and walls of the whorls into the central cavity of the shell.

The Cretaceous ushers in another lot of families: Solariidae, Cassididae, Doliidae, Tritonidae, Buccinidae, Muricidae, Purpuridae, Volutidae, Olividae, Cancellaridae, Pleurotomidae, Conidae, in fact, all the more specialized families of the Ctenobranchiata, including more pronounced siphonate forms. The gastropods hold third rank among the Cretaceous mollusks, being excelled by the clams and cephalopods. In the Tertiary the gastropods rise to first rank. Among the few new families appearing in the Tertiary the more important are the Harpidae and Ovulidae. The siphonostomate shells attain here their highest development, and are more prominent than any others. All the Tertiary forms are closely allied to modern forms; indeed, the majority of the Pliocene fossils and a small per cent. of the Miocene species are still living in the modern ocean. At the present day the gastropods are enjoying rapid progressive evolution.

The history of terrestrial and fresh-water gastropods is interesting. The earliest form known is Pupa, found in the Devonian beds of Saint John, N. B., while a Pupa and a Zonites, remarkably close to the existing species, have been found in the coal measures of the Carboniferous. In the Mesozoic are found numerous fluviatile genera, such as Planorbis, Melania, Hydrobia, Valvata, Physa, Limnaea, Amnicola, and Carychium. In the Cretaceous appear, in addition to those already cited in the Jurassic, Vivipara, Glandina, Bulimus, Goniobasis, Lioplax, Pleuroceras, and in the Tertiary deposits the land and fresh-water snails are quite as abundant as they are at the present time.

Some interesting evolutionary series have been worked out among fossil gastropods. Neumayr has shown how Vivipara of the Miocene beds of Slavonia starts in the lower layers as smooth shells with rounded whorls, and changes, or evolves, through the succeeding overlying beds by successive intermediate stages into a more elevated shell, with concave whorls and nodose surfaces, that occurs only in the highest beds. Hilgendorf, and afterwards Hyatt, showed the peculiar transformations of Planorbis in the fresh-water Miocene beds of Steinheim, Württemberg. Other similar evolutionary series have been worked out for the Melaniidae, Cerithiidae, Volutidae, Mitridae, and Turritellidae.

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GASTROSTOMY (from Gk. γαστήρ, gastēr, stomach + στήμα, stoma, mouth). An operation which is performed for the relief of stricture of the gullet. Its object is to relieve the patient from the imminent risk of starvation, by introducing food directly into the stomach through an external opening. The well-known case of Alexis Saint Martin, and numerous experiments on the lower animals, first led to the introduction of the operation as a practical surgical procedure.

GASTROTOMY (from Gk. γαστήρ, gastēr, stomach + τομή, tomē, a cutting, from τέμνω, temnō, to cut). An incision into the cavity of the abdomen (q.v.) for the purpose of removing some diseased structure or foreign body. The term has also been applied to the Cæsarean operation (q.v.).

GASTRULA. See EMBRYOLOGY; GASTRÆA THEORY.

GASZYNSKI, gâ-shîn'skê, KONSTANTY (1809-66). A Polish poet, born at Malawies. He fought in the insurrection of 1830, and afterwards went to France and settled at Aix in Provence. During this exile he wrote much verse and prose, which has frequently been translated into French. His sonnets are particularly elegant. His works include: *Poczye* (1844); *Sicilanka młodości* (1855); *Rzeczy pamiętnikow Macieja Rogowskiego* (1847); *Kontuszoire pogadanki* (1851); *Listy z podróży po Włoszech* (1853); and *Pan Decydery Boczek* (1846). He also contributed to magazines and newspapers. His complete works were published in 1870-74.

GATA, gâ'tâ, CAPE DE. See CAPE DE GATA.

GATACRE, gât'â'kêr, Sir WILLIAM FORBES (1843-). An English soldier. He entered the Seventy-seventh Foot in 1862, passed at the Staff College in 1874, and from 1875 to 1879 was instructor in surveying at the Royal Military College. In 1889-90 he commanded the Mandalay Brigade, and in 1898 was in command of the

British forces in the Sudan during the first march against Atbara. He also commanded the British division in the advance against Khartum and Omdurman, and was assigned to the command of the troops of the Eastern District. During the Second Boer War he commanded the third division of the South African Field Force. He attained the rank of lieutenant-general.

GATAKER, gät'a-kër, THOMAS (1574-1654). A Puritan clergyman, critic, and author, born in London. He was educated at Saint John's College, Cambridge, and in 1596 was nominated a fellow of Sidney Sussex College. In 1601 he became lecturer at Lincoln's Inn, and from 1611 was rector of Rotherhithe (Surrey). He declined the mastership of Trinity College, Cambridge, and in 1643 was appointed a member of the Westminster Assembly of Divines. In 1645 he was elected one of seven empowered for draughting a confession of faith. He was a scholar of unusual acquirements in Hebrew and the classics. His *Marcus Antoninus de Rebus Suis* (1652), with the Greek text accompanied by a version and commentary in Latin, has been called by Hallam "the earliest edition of any classical writer published in England with original annotations." He also prepared commentaries on Isaiah, Jeremiah, and Lamentations for the Assembly's *Annotations* (1645, 1651). His *Opera Critica*, including a *De Novi Instrumenti Stylo Dissertatio* (1648), were edited by Witsius (Utrecht, 1698). Several controversial writings and a collection of sermons (1637) also appeared from his pen. Consult Brook, *The Lives of the Puritans* (3 vols., London, 1813).

GATCHINA, gä'chè-nä. A town of Russia in the Government of Saint Petersburg, situated about 23 miles south-southwest of the capital on a small lake formed by the Izhora (Map: Russia, D 3). It is especially worthy of mention for its imperial palace, constructed in 1770, which contains 600 rooms, a theatre, and art collections. It is surrounded by a magnificent park. It originally belonged to Prince Orloff, who received it from Catharine II. After his death it reverted to the Crown and became the favorite summer residence of Czar Paul I., who bestowed municipal rights upon the town in 1797. Gatchina is a very popular summer resort with the residents of the capital. Population, in 1897, 14,735.

GATE CITY. A popular name for Keokuk, Iowa, from its situation at the head of navigation on the Mississippi, and for Atlanta, Ga., which was so named by Jefferson Davis on account of the importance of its position.

GATE HOUSE PRISON. A prison in Westminster, London, from which, on October 29, 1618, Sir Walter Raleigh was led to the scaffold in Old Palace Yard.

GATE OF THE LIONS. See LION GATE.

GATE OF THE MEDITERRANEAN. The Strait of Gibraltar, as the passage between the Atlantic and the Mediterranean.

GATES, HORATIO (1728-1806). An American soldier, prominent in the Revolutionary War. He was born at Malden, Essex County, England, his parents being servants in the household of the Duke of Leeds. He entered the army when very young, came to America in 1755, and, as major, served under Braddock (q.v.) and was severely

wounded at the defeat of the latter on July 9th of the same year near Fort Duquesne (Pittsburg). In 1760 he was stationed, as brigademajor, under General Monckton, at Fort Pitt (Pittsburg), and in 1762 was Monckton's aide at the capture of Martinique. Buying a farm in Berkeley County, Va., in 1763, he lived there in retirement until July, 1775, when Congress appointed him adjutant-general in the regular army, with the rank of brigadier. In 1776 he was appointed to the command of the army which had lately retreated from Canada, and immediately began intriguing to supplant General Schuyler as the commander of the Northern Department. This he did through the influence of the New England delegates in Congress, on August 2, 1777. The army under his command, after fighting the battles of Stillwater and Saratoga, forced Burgoyne to surrender on October 17th. (See SARATOGA, BATTLES OF.) Gates received nearly all of the credit, though Schuyler, Arnold, and Morgan had done most of the work, and he had been conspicuous chiefly for incapacity and for an apparent lack of personal courage. Soon afterwards he entered into the schemes of the Conway Cabal (q.v.), whose object was to have him appointed, in Washington's stead, as commander-in-chief. For a time he was president of the newly organized Board of War, but was detected in several falsehoods, became discredited, and withdrew in 1778 to his farm in Virginia, where he remained until 1780, when he was put in command of the Army of the South. Owing chiefly to his wretched generalship, his forces were totally defeated near Camden, S. C. (q.v.), on August 16th by Lord Cornwallis, and on December 2d he was superseded by General Greene. A court of inquiry, appointed to investigate his conduct, sat until 1782, and finally acquitted him. He then again retired to his Virginia farm, and lived there until 1790, when, after freeing his slaves, he removed to New York City, where he remained until his death, April 10, 1806. Personally, he was handsome, affable, and courteous, and in society was a general favorite. For his part in the Saratoga campaign, consult Stone, *Campaign of Lieutenant-General Burgoyne* (Albany, 1877).

GATES, LEWIS EDWARD (1860-). An American critic, born at Warsaw, N. Y. A graduate of Harvard, he has been chiefly connected with that institution in the departments of English and comparative literature. He has won reputation as a subtle critic, especially by his essays on Cardinal Newman, Francis Jeffrey, and Matthew Arnold prefixed to volumes of selections from their writings edited for use in colleges. Among his other books may be named *Studies and Appreciations* (1900).

GATES, MERRILL EDWARDS (1848-). An American educator. He was born at Warsaw, N. Y., the son of Seth Merrill Gates (q.v.), graduated at the University of Rochester in 1870, and from 1870 to 1882 was principal of the Albany Academy. From 1882 to 1890 he was president of Rutgers College, and from 1890 to 1899 was president of Amherst College. He became widely known through his efforts to promote education, civil-service reform, and ballot reform, and in 1884 was chosen chairman of the United States Board of Indian Commissioners. Among his publications are: *Sidney Lanier, Poet and Artist*;

Land and Law as Agents in Educating the Indians; and International Arbitration.

GATES, SETH MERRILL (1800-77). An American lawyer, born at Winfield (Herkimer County), N. Y. He was admitted to the bar in 1827, and in 1833 was elected to the State Legislature of New York. In 1838, and again in 1840, he was elected a member of Congress, and in 1848 was defeated as the Free-Soil candidate for the Lieutenant-Governorship of New York. He draughted, in 1843, the protest signed by the Whigs in Congress against the annexation of Texas to the Union. In 1838 he became editor and proprietor of the *Le Roy Gazette*. So pronounced was he in his hostility to slavery that a Southern planter offered a reward of \$500 for his apprehension.

GATES, Sir THOMAS (?-c.1621). The first regular Colonial Governor of Virginia under the Virginia Company. He was born probably at Colyford, Devonshire, England; entered the military service; accompanied Sir Francis Drake on his voyage to America in 1585-86, and for his conduct at the capture of Cadiz was knighted in June, 1596. In 1598 he entered Gray's Inn, and in the following year was engaged in public service at Plymouth; but soon afterwards he enlisted, together with Sir Thomas Dale (q.v.), in the service of the Netherlands. He was one of the first petitioners for royal license to colonize Virginia and was one of the incorporators of the first Virginia charter of 1606. Having obtained a leave of absence from the States-General, he was chosen the first Deputy Governor of Virginia, and was placed in command, with Sir George Somers and Captain Newport, of the fleet of nine vessels, carrying 500 colonists, which sailed for America in 1609. The *Sea Venture*, carrying Gates, Somers, and Newport, was wrecked on the Bermudas, where, within the next nine months, two new vessels were constructed. Leaving the Bermudas on May 10, 1610, Gates arrived at Jamestown in May, near the close of the 'starving time,' and was installed with great ceremony as Deputy Governor, replacing George Percy, the retiring president of the King's Council. The famished colonists clamoring to be taken from Virginia, Gates crowded them upon four small vessels and started with them for England, but was met at the mouth of the James River and turned back by Lord De La Warr (q.v.), who, in turn, was installed as Governor. Gates was sent to England for a new supply of cattle; returned to Jamestown in 1611 with six ships and 300 colonists, and remained as Lieutenant-Governor until March, 1614. He afterwards served on one of the committees of the Virginia Company, and in 1620 was appointed by James I. one of "the first moderne and present Council established at Plymouth, in the County of Devon, for the planting, ruling, and governing of New England in America." For an account of the administration of affairs in Virginia by Gates, consult Brown, *The First Republic in America* (Boston, 1898).

GATESHEAD. A large manufacturing town in Durham County, England, on the south bank of the Tyne, opposite Newcastle, of which it is practically a suburb, and with which it is connected by three bridges (Map: England, E 2). The community is almost entirely industrial, and

finds employment in the neighboring coal-mines, in the Gateshead Fell quarries celebrated for 'Newcastle grindstone,' in the locomotive works of the Northeastern Railway, in iron ship-building yards, iron-foundries, cable and wire-ropes factories, and in chemical, cement, and glass works. At Gateshead a large portion of the first Atlantic cable was manufactured. Its history dates from the Roman occupation, and some portions of the town are very ancient. The chief architectural features are the town hall, free library, various denominational churches, and the restored parish church of Saint Mary's, established in the eleventh century, and in 1080 the scene of Bishop Walcher's murder by an avenging English mob. Daniel Defoe's dwelling, where he wrote *Robinson Crusoe*, is in the Hillgate district. The town owns a profitable corporation quay, and maintains baths, wash-houses, cemeteries, public parks, recreation grounds, and public libraries. There are steam tramways; gas and water are supplied by private companies. Gateshead sends a member to Parliament. Population, in 1891, 85,000; in 1901, 110,000. Consult Welford, *History of Newcastle and Gateshead* (Newcastle-on-Tyne, 1884-85).

GATESVILLE. A city and the county-seat of Coryell County, Tex., 45 miles west of Waco, on the Leon River and on the Saint Louis Southwestern Railroad (Map: Texas, F 4). It is the seat of the State House of Correction and Reformatory. The city ships cotton, grain, and live stock, and has cotton gins and compress, flouring and planing mills, etc. Population, in 1890, 1375; in 1900, 1865.

GATEWAY. The passage or opening in which a gate or large door is hung. This may be either a mere opening in a wall or a covered way vaulted or roofed over. It differs from a doorway in that it does not open directly into a building. A monumental gateway and doorway are often both called a *portal* (q.v.). The gateway, being a most important point in all fortified places, is usually protected by various devices. It is flanked by towers with loopholes, from which assailants may be attacked, and is frequently overhung by a machicolated battlement, from which missiles of every description were poured upon the besiegers. City gates, and gates of large castles, have in all ages been the objects of great care in construction; and when from some cause, such as the cessation of constant fighting, or a change in the mode of warfare, gateways have lost their importance in a military point of view, they have maintained their position as important architectural works, and where no longer useful, have become ornamental. In very ancient times, we read of the 'gate' as the most prominent part of a city where proclamations were made, and where the kings administered justice. This was especially the case in the Orient, where the gateway held the same place as the Greek *agora* and the Roman Forum, business of all kinds being transacted there. Hence the modern term 'The Sublime Porte' used of the Turkish Government. Such gateways are often mentioned in the Old Testament, and the great Assyro-Babylonian city gates, especially those of Sargon's city, at Khorsabad (q.v.), illustrate the texts. They were great inclosures with cool passages and courts where scribes, venders, and lawyers sat. The Greek and Roman

gates were frequently of great magnificence. The Propylæa at Athens is a beautiful example, and the triumphal arches of the Romans were often identical with their city gates. The Lion Gateway at Mycenæ and the city gates of Segni and Alatri in Italy are good examples of early Cyclopean structures before the seventh century B.C. Those at Frentino, Viterbo, and Falerii show the pre-Roman arched style. The Roman gates at Verona, the Golden Gateways at Jerusalem, the gates at Spalato and Benevento, and others in Gaul, Syria, Asia Minor, and North Africa show every variety of design and number of openings. In the Middle Ages the city gateways were often crowned by towers of imposing architecture, especially in North Germany, as in Lübeck and Nuremberg, and the same was the case with the gateways of bridges and secular buildings, such as those of Oxford and Cambridge. The castle gateways, of which many remain, have but seldom any decorative character, being for defense, but the monastic doorways, leading into the great inclosed courts, were often architecturally beautiful, as in the Cistercian monastery at Casamari in Italy, with its double porch, porter's lodge, and living-rooms. The abbey gates of Canterbury and Bury Saint Edmund's are well known. All closes, whether of abbeys, colleges, law courts, guilds, fraternities, or the like, had architectural gateways. The Gothic Renaissance and Rococo styles are especially rich in designs, which have been followed by modern architects. Parks, private grounds, and avenues are often entered through such gates.

GATH (Heb., wine-press). One of the five cities of the Philistines. It was probably situated at the modern Tell es-Safiyeh, 'the white hill'; though the Crusaders identified it with Yebna, the ancient Jamnia, and some modern scholars have adopted this view. The first mention of Gath is in the list of Palestinian towns conquered by Thothmes III., where it is referred to as Kntu (Kintu). In the Amarna letters it occurs several times as Gimti and Ginti, there being an Egyptian governor in this city in the time of Amenhotep IV. Its position on the borders of Judean territory made it of great importance in the wars with the Philistines. The Philistine champion Goliath (q.v.) came from Gath (I. Sam. xvii. 4). David took refuge with Achish, King of Gath (ib. xxi. 10), and probably also obtained a wife in Gath. It is possible that Gath was in the hands of the Israelites in the time of David. Whether Solomon and Rehoboam were able to keep it cannot be determined in view of the probable late date of the statements. During the wars with Assyria Gath seems to have formed a part of Ashdodite territory. Sargon mentions in the Khorsabad inscription that he besieged and conquered Gimtu, probably in the year B.C. 711. The absence of Gath in many passages where the other Philistine cities are mentioned may be accounted for by its being regarded as a dependency of Ashdod. In the days of Eusebius and Jerome the city still existed, and the description of the site in the *Onomasticon* seems to point to Tell es-Safiyeh. At this place the *Blanca Guarda* was erected by Foulques of Anjou in 1144. The fortress was taken by Saladin in 1191, and recaptured and fortified by Richard in 1192. Situated on a hill 300 feet above the plain

with steep walls upon three sides, it was at all times a difficult place to capture and an important stronghold. There is to-day a small village on the top of the hill. Consult: Smith, *Historical Geography of the Holy Land* (London, 1895); Buhl, *Geographie des alten Palästina* (Leipzig, 1896).

GÂTHÂS, gâ'thâz (Av. *gâtha*, Skt., Pali *gêthā*, song). The name applied to certain metrical compositions, both in the Avesta and in Sanskrit Brahmanic and Buddhistic literature. The Gathas of the Avesta comprise 17 hymns (Yasna 28-34, 43-51, 53), which contain 232 stanzas, besides three in Yasna 27. 13-14 and Yasna 54. They are composed in five metres, which are reckoned by the number of feet, not by their quantity, as in Greek and Latin. These metrical schemes, which are of great antiquity, are composed respectively of three-line stanzas of 7 + 9 (or sometimes 8) syllables (Ahunavaiti), five-line stanzas of 4 + 7 syllables (Ushtavaiti), four-line stanzas of 4 + 7 syllables (Spentamainyu), three-line stanzas of 7 + 7 syllables (Vohukhshathra), and four-line stanzas, whose first two lines have 7 + 5, and the last two 7 + 7 + 5 syllables (Vahishtoishiti). The dialect in which these hymns are written differs considerably from the ordinary Avesta, and is more archaic in character. If we may reason on the analogy of the Gathas of the Buddhist Jatakas (q.v.), where verse alternates with prose, it might be plausibly suggested that the Avesta Gathas represent but a small part of the original content of this portion of the Zoroastrian Scriptures. There may have been a large amount of prose between the stanzas which has been lost. The Iranian tradition ascribes the authorship of the Gathas to Zoroaster (q.v.) himself. They are of peculiar difficulty, owing in part to the inflectional system of the Gatha-Avesta dialect, and in part to the numerous words which occur but once in them and have no representatives, so far as known, in any other Indo-Iranian or even Indo-Germanic language. Their interpretation is aided, however, to a large degree, by a Pahlavi version with glosses, which was translated into Sanskrit by a Parsi priest, Neryosangh, probably about A.D. 1200. These versions, while important, are not altogether trustworthy, mainly on account of the decay of grammatical knowledge of the Avesta language. They are, notwithstanding, indispensable in interpreting the Gathas, and mainly through their aid the meaning of the hymns is now for the most part tolerably certain.

In India the term Gatha was employed in the Brahmanas (q.v.) to denote verses of religious content which did not belong to any of the four Vedas. (See VEDA.) It became wider in its scope in the Buddhistic literature, and denoted especially that part of the sacred canon which comprised the Dhammapada, Theragatha, Therigatha, and the pure verse sections of the Suttanipata, and also to the verses in the Jatakas. It is most commonly applied, however, to the North Buddhist Lalita-Vistara (q.v.), composed in verse mingled with prose. This work is in a dialect, probably artificial, of Prakrit words with Sanskrit terminations, and on account of this peculiarity the language of the Lalita-Vistara is often called the Gatha dialect, although prose works were sometimes written in it. Consult: Haug, *Die fünf Gâthâs* (Leipzig, 1858-60); Bartholomæ, *Die Gâthâs und heiligen Gebete des altiranischen*

Volkes (Halle, 1897); Mills, *A Study of the Five Zarathushtrian [Zoroastrian] Gāthās* (Oxford, 1892-94); id., *A Dictionary of the Gāthic Language of the Zend Avesta* (ib., 1901 et seq.); id., *The Gāthās of Zarathushtra [Zoroaster] in Metre and Rhythm* (ib., 1900); Müller, "Der Dialekt der Gāthās des Lalitavistara," in *Beiträge zur vergleichenden Sprachforschung*, vol. viii. (Berlin, 1876). See *AVESTA*; *LALITA-VISTARA*; *ZOROASTER*.

GATINEAU, gā'tè'nō'. A large river of Quebec, Canada, rising in a connected chain of large lakes immediately north of the forty-eighth parallel of latitude (Map: Canada, P 7). It flows first south-southwest, and then almost due south, and falls into the Ottawa one mile below Ottawa City. The length of the river is estimated at 400 miles; it receives a number of tributaries, and is extensively used for floating down the lumber of the upper region.

GATLING, RICHARD JORDAN (1818-1903). An American inventor. He was born in Hertford County, N. C., and during his boyhood he acquired considerable skill and mechanical acumen working as his father's assistant in the perfection of a machine for sowing cottonseed. His principal invention, and the one by which he became famous, was the revolving gun, since known by its inventor's name. In 1886 he invented a new gun-metal of steel and aluminum. Congress afterwards voted him \$40,000 to experiment on a new method of casting cannon. Among his other inventions may be noted a hemp-breaking machine and a steam plow. Although a graduate of the Ohio Medical College (1850), he never practiced medicine. See *MACHINE GUN*; *ORDNANCE*.

GATSCHET, gā'shā', ALBERT SAMUEL (1832—). An American philologist and ethnologist, born at Saint Beatenberg, Bern, Switzerland. He studied at the universities of Bern and Berlin, made investigations regarding the Swiss dialects, and published *Ortsctymologische Forschungen als Beiträge zu einer Toponomastik der Schweiz* (1865-67), and *Promenade onomatologique sur les bords du Lac Léman* (1867). In 1868 he removed to the United States, where until 1877 he was connected with the staffs of various German newspapers, and in that year was appointed ethnologist of the Government Geological Survey. He became linguist to the Bureau of American Ethnology in 1879. From 1874 he made extensive study of the languages of the North American Indians, in particular those of the Tonkawa, Yuma, Chumeto, Hitchiti, Creek, and Timucua tribes. Among the many valuable treatises published by him, in both English and German, are: *Zwölf Sprachen aus dem Südwesten Nordamerikas* (1876); *Analytical Report upon Indian Dialects Spoken in Southern California, Nevada, and on the Lower Colorado River* (1876); "Classification of Western Indian Dialects," in volume vii. of the *Report of the Geological Survey West of the 100th Meridian* (1879); *Volk und Sprache der Timucua* (1881); *Indian Languages of the Pacific States and Territories and of the Pueblos of New Mexico* (1882); "A Migration Legend of the Creek Indians," in No. 4 of Brinton. *Library of Aboriginal American Literature* (Philadelphia, 1884-88); and "The Indians of Southwestern Oregon," in *Contributions to North American Ethnology*, vol. ii. (Washington, 1890). For a further list of

titles, consult Pilling, *Bibliography of North American Languages* (Washington, 1885).

GATSCHINA, gā'chē-nā. See *GATCHINA*.

GATTEAUX, gā'tō', JACQUES EDOUARD (1788-1881). A French sculptor and engraver, born in Paris. He was the pupil of his father, Nicholas Marie Gatteaux, and won the Prix de Rome (1809) for medaling. He was one of the founders of the 'Galerie Numismatique des Illustrations Françaises' in Paris. He was employed by the French Government to strike a medal commemorative of the establishment of the School of Architecture. Others of his famous medals are those for the "Holy Alliance" and the Peace of 1814. He was elected to the Institute in 1845, and left his art collection to the Ecole des Beaux-Arts and the Louvre. His busts include those of Michelangelo, in the Louvre, and of Rabelais, at Versailles.

GATTERER, gāt'ër-ër, JOHANN CHRISTOPH (1727-99). A German historian, born at Lichtenau. He studied at the University of Altdorf, and in 1759 became professor of history at Göttingen, where from 1767 he was also director of the historical institute established by himself in 1764. He was the first to introduce into the historical courses of German universities geography, diplomacy, heraldry, and other auxiliary studies. The most important of his works are: *Die Weltgeschichte in ihrem ganzen Umfange* (2 vols., 1785-87), and the *Versuch einer allgemeinen Weltgeschichte bis zur Entdeckung von Amerika* (1792). Consult *Elogium Gattereri*, by Heyne (Göttingen, 1800).

GATTI, gāt'tè, BERNARDINO (c.1497-1575). called 'Il Sojaro' (the cooper). An Italian painter, born at Parma. He was the pupil of Correggio, and so like him in his manner that his pictures have been mistaken for that master's. A French critic says: "Gatti had the misfortune to be born a copyist in a century of mighty geniuses." He also imitated Pordenone, and was selected to complete the frescoes left unfinished by him in the Santa Maria di Campagna, Piacenza. Gatti's works include paintings in the Parma Cathedral and in the Church of Saint Peter there, and an altarpiece, "Madonna with the Rose Garland" (1531), his principal work, in the Cathedral of Pavia.

GATTY, Mrs. MARGARET (1809-73). An English novelist. She was born in 1809, and in 1839 married a clergyman, and passed most of her life after marriage at Ecclesfield, in Yorkshire, becoming widely known by *The Fairy Godmothers* (1851) and *Parables from Nature* (five series, 1855-70), translated into the leading languages of Europe. In 1866 she started a monthly periodical for young people, called *Aunt Judy's Magazine*, which, after her death in 1873, was continued by her daughters till 1885. Here first appeared nearly all the stories of her daughter, Mrs. Juliana Ewing (q.v.).

GAU, gou (Ger., district). A word used to designate those portions of a district outside of a town. It embraced several communities, and was governed by a *graf*. Its use prevailed during the Middle Ages as a name for a political division of the German country, having especial reference to the power of the military and judicial authorities.

GAUBIL, gô'bél', ANTOINE (1689-1759). A French Jesuit missionary to China, and a scholar of great versatility. He was born at Gaillac, became a Jesuit at the age of fifteen, and in 1723 was sent to China, where he learned Chinese and Manchu with wonderful facility. His scholarship won him a place at Court, in spite of the Emperor's aversion to the missionaries, and his influence kept the Jesuits from being disturbed. He was made interpreter, and was especially prominent in carrying on diplomatic correspondence with Russia, besides being head of the Imperial Colleges under Kien Lung when he succeeded Yung Ching. A correspondent of the Paris Academy of Sciences and a member of the Academy of Saint Petersburg, he was one of the earliest European sinologists. Père Gaubil died in Pekin. He wrote: *Histoire de Gentchiscan et de toute la dynastie des Manchoux* (1739); *Traité de chronologie chinoise* (1814); and a translation of *Le Chou King* (1771), besides many letters and sketches published in *Lettres édifiantes* and in Rémusat, *Nouveaux mélanges asiatiques*.

GAUCHOS, gou'chôz (countrymen). Pastoral nomads of Chaco, in the Argentine Republic, South America, the offspring of whites and Indians of the Pampas. They are tall and handsome, with a proud and dissolute expression of countenance. They wear mustaches, and have long black hair hanging down their backs. Their costume is brightly colored. They are very polite, and possess high ideas of their own equality and dignity. These hybrids can scarcely be traced to their original Guaycuru Indian components; but since the white infusion has ceased the people are reverting to the Indian type, thus showing a most interesting example of the formation of a new race. The free, wild life of the Pampas has developed the Gauchos into an alert, vigorous people, expert horsemen and cattlemen, who wield the lariat with great skill. The bolas (q.v.) is also employed in the chase and in warfare.

The Gauchos eat meat exclusively for months together, and with it a large proportion of fat. It has been observed that they dislike dry meat. Curiously enough, they do not eat salt. The men are proficient in leather-working, and the women weave belts and dress skins.

GAUDEAMUS (Lat., Let us rejoice). The first word and the title of a well-known Latin student song popular in Germany and America. It is based partly on a Latin song dating from 1267, and existed in the eighteenth century in a somewhat obscene form, with German as well as Latin verses. The present version dates from 1781. The song recalls the transitory character of human things, and urges the enjoyment of life before old age comes on.

GAUDEN, ga'den, JOHN (1605-62). An English prelate and author. He was born at Mayland, Essex, where his father was vicar. After education at Bury Saint Edmund's, he entered Saint John's College, Cambridge, and obtained the degrees of B.A. and M.A. While a tutor at Oxford he took the degree of B.D. at Wadham College in 1635, and D.D. in 1641. His pupil, Sir Francis Russell, presented him with the living of Chippenham in 1640, and the same year he was the appointed preacher to the House of Commons. After the Restoration, in 1660, he

was appointed Bishop of Exeter, and in 1662 was translated to the bishopric of Worcester. He died four months later (September 20, 1662). His publications number some thirteen or more books, which appeared between 1642 and 1660. At first he was inclined to the Parliamentary cause, but in the end he strongly opposed the Puritan excesses. Among his more forcible writings may be mentioned *Cromwell's Bloody Slaughter House; or, His Damnable Designs in Contriving the Murder of His Sacred Majesty King Charles I. Discovered* (1660). He is best known on account of the controversies which have raged over the authorship of *Eikon Basilike*, a book attributed to Charles I. himself. It was published immediately after the execution of the King, and, according to Malcolm Laing, "had it appeared a week sooner, it might have saved the King's life." The Bishop claimed its authorship in correspondence with Chancellor Hyde, Lord Clarendon (1660-62). Burnet in 1674 stated that the Duke of York told him that Dr. Gauden was the author, and in November, 1686, at the sale of the Marquis of Anglesey's choice library of books, the 'famous memorandum' was found in the peer's copy of the *Eikon Basilike*—"King Charles II. and the Duke of York have both assured me that this work was none of the King's compiling, but made by Dr. Gauden, Bishop of Chester(?), which I here insert for the undeceiving of others in this point, by attesting so much, under my hand." A sharp controversy arose, which has been revived on various occasions up to as late as 1880. In *Who Wrote Icon Basilike?* (3 vols., 1824-28), Dr. Christopher Wordsworth 'proves' that the King did. Sir James Mackintosh, reviewing Wordsworth's book in the *Edinburgh Review* (xliv.), 'proves' that Gauden wrote it. Macaulay, Guizot, and other historians sustain Gauden's claim. Consult Almach, *Bibliography of the King's Book* (London, 1896). See EIKON BASILIKE.

GAUDRY, gô'drê', ALBERT (1827-). A French paleontologist, born at Saint-Germain-en-Laye. From 1853 he traveled in the Orient, and from 1855 to 1860 in Greece, where he was occupied with paleontological researches. He was then appointed assistant naturalist in the Museum of Natural History in Paris, where in 1872 he became professor. In 1882 he was elected a member of the French Academy of Sciences. His works include: *Recherches scientifiques en l'Orient* (1855); *Animaux fossiles et géologie de l'Attique* (2 vols., 1862-67); *Animaux fossiles du Mont-Lébéron*, with Fischer and Tournouër (1873); and *Enchainements du monde animal dans les temps géologiques* (1878).

GAUDY, gou'dê, FRANZ BERNHARD HEINRICH WILHELM, Baron von (1800-40). A German author, born in Frankfort-on-the-Oder. In 1818 he entered the Prussian Army, but resigned from the service in 1833 to follow a wholly literary career, and at Berlin was a friend of Chamisso, with whom he edited the *Deutscher Musenalmanach* for 1839. His best-known work is his humorous and frequently epigrammatic verse. Some of his poems became widely popular. Of his prose writings, *Tagebuch eines wandernden Schneidergesellen* (1836) and *Venezianische Novellen* (1838) are still popular in Germany. The more important of his writings appeared at Berlin in 1853 (8 vols.), edited by Arthur Müller.

GAUERMANN, gou'ér-mán, FRIEDRICH (1807-62). An Austrian genre, landscape, and animal painter, born at Miesenbach, Lower Austria, September 20, 1807. He was a son of the landscape painter Jakob Gauermann. Under his father's direction he began studies in landscape, and he also diligently copied the etchings of the chief masters in animal painting which were contained in the Academy of Fine Arts and the Imperial Library of Vienna. In the summer he made art tours in Styria, Tyrol, and Salzburg. Two animal pieces which he exhibited at the Vienna exhibitions of 1824 were regarded as remarkable productions for his years, and led to his receiving commissions in 1825 and 1826 from Prince Metternich and others. His reputation was greatly increased by his picture "The Storm," exhibited in 1829, and from that time his works were much sought after and obtained correspondingly high prices. His "Field Laborer" was regarded by many as the most noteworthy picture in the Vienna Exhibition of 1834, and his numerous animal pieces have entitled him to a place in the first rank of painters of that class of subjects. Gauermann was sincere and exact in his representation of German peasantry, according to their locality, individual habit, and environment, and though he is largely represented by pictures of animals, he painted such rural scenes as: "Husbandmen Ploughing;" "Cows, Sheep, a Horse, etc." (in the Leipzig Museum); "Rural Smithy;" and "Watering Place in the Tyrol" (Berlin National Gallery). He was made member of the Munich Academy in 1836. Gauermann left at his death, which occurred at Vienna, July 7, 1862, over 1000 oil paintings, 565 drawings, and 15 unfinished pictures.

GAUGE (from OF. *gaugē*, *jauge*; connected with ML. *gaugatum*, gauging of a wine-cask, *jalgium*, right to gauge wine-casks, and probably with *jalea*, gallon, OF., Fr. *jale*, bowl). In mechanics, an instrument for determining the dimensions, quantity, force, capacity, etc., of anything. Gauges are of various forms, and are employed for numerous purposes in engineering and the arts. Gauges to secure precision in the dimensions and forms of manufactured articles are made of hardened steel, or of case-hardened wrought iron, formed to the exact outline to be secured and accurately dimensioned. Such gauges are extensively used in machinery manufacture where interchangeability of corresponding parts is sought. Wire gauges are circular disks of hardened steel, having round the edge a series of notches of different sizes of openings corresponding to the standard wire sizes of the Birmingham or other gauges. In the Birmingham wire gauges the sizes run from No. 1, denoting a wire diameter of 0.3 inch, to No. 34, denoting a wire diameter of 0.004 inch. Similar gauges are used for measuring the thickness of metal plates. Pressure-gauges for measuring the pressure of steam or other gas inside a closed vessel are familiar to all. In the most usual form the pressure of the gas acts to cause a pointer to move around a graduated dial. The steam-boiler gauge is a familiar example of such devices. Wind-gauges are arrangements by which the wind blowing against a plate diaphragm actuates a recording device which records the pressure. (See **ANEMOMETER**.) Water-gauges consist of a strong glass

tube with metal fixtures at its ends, which connect the tube with the interior of a steam boiler. The lower end of the tube connects with the boiler below the lowest water-line, and the upper end connects with it above the highest water-line, and the level of the water between the two points is observable by the height at which it stands in the glass. Screw-gauges consist of a U-shaped frame of steel at the end of one arm of which is a steel plug pointing toward the opposite arm, through whose end runs a finely threaded thumb-screw with a graduated head. To measure with this device the end of the plug is brought into contact with one side of the object, and the screw run out into it touches the other side; a reading of the graduated head shows the distance apart of the end of the plug and the end of the screw, and therefore the thickness of the object. See **CALIPERS**; **RAILWAYS**.

GAUGENGIGL, gou'gen-gē'g'l, IGNAZ MARCEL (1856—). An American genre painter, born at Passau, Bavaria. He studied under Raab and Diez at the Munich Academy. Afterwards he came to America, and settled in Boston in 1879. His subjects are usually interiors, with several figures painted in the miniature style of Meissonnier. His pictures are: "The Duel," "The First Hearing," "My Studio," and "On the Promenade."

GAUGER. A United States custom-house officer whose duty is to gauge or measure casks and other hollow vessels, containing liquids liable to duty. Local officers are to be found in many States also, whose duties are of a similar nature. These are often known as sealers of weights and measures.

GAUGUA, gou'gwá. See **GUAGUA**.

GAUL (Lat. *Gallia*). The name given by the Romans to that portion of Western Europe which is in the main identical with France, although extending beyond the bounds of the modern State. In the earliest times this region, bounded by the Atlantic, the Rhine, the Alps, the Mediterranean, and the Pyrenees, was inhabited by the Gauls, who had overrun the territory, and had brought under control the earlier peoples, such as the Ligurians, along the southern coastline, and the Iberians, who had subjugated the southwestern section and are represented by the Basques of modern days. The Greeks founded Massilia (Marseilles), a Phœcean colony, about B.C. 600. They called the people *Κελταί*, either, as Thierry suggests, extending the name of one tribe to the entire race, or using a generic term to indicate the collective Celtic people. Later the Greeks named the country *Γαλαρία*, and the Romans spoke of the Galli and of Gallia. These words are cognate with the native title *Gaeltachd*, which means 'the land of the Gauls,' and which designated the territory above defined, but did not include the two islands known as Albion or Albin, the White Island, and Erin (*Eri* or *Iar* = the West), the Isle of the West, which were inhabited by the same race.

Julius Cæsar is the first writer who enlightens us in regard to this people. He speaks of Gaul as being divided among the three peoples, the Belgæ, the Aquitani, and the Galli, or, "as they are known in their own tongue," Celtæ. The Belgæ dwelt on the north with the Seine as their southern boundary, the Aquitani in the south between the Garonne and the Pyrenees, while the

Celtæ dwelt between them. All these differed in language, customs, and laws. This description is substantially correct, although Cæsar does not mention all the races of Gaul, nor does he recognize the fact that the Aquitani were really distinct in race from the Belgæ and Celtæ, who were closely related. The Aquitani were Iberian in stock, and this racial difference was indicated by marked differences in temperament and physical characteristics. The Gauls were tall, of light complexion, sociable in disposition, given to fighting in large numbers, while the Aquitani were dark, reserved in disposition, and fond of fighting in small bands, traits which are found among the Basques to-day.

Cæsar mentions numerous tribes belonging to the three nations distinguished by him. Such were the Helvetii, the Sequani, and the Aedui along the Rhône and Saône, and the Arverni (modern Auvergne) among the mountains (Cevennes); along the Loire the Namnetes, Senones, and Carnutes, and between the Loire and the Seine the Armorican or maritime tribes, such as the Veneti. The Bellovacii, Suessiones, Nervii, and Morini were tribes of the Belgæ.

The part the Gauls played in the ethnic distribution of the early peoples of Europe was remarkable. In their nomadic history they wandered far and wide throughout Europe, Asia, and Africa. From their home in Western Europe they spread to Britain, invaded Spain, swarmed over the Alps into Italy, and, extending their conquests to the Tiber, burned Rome (B.C. 390). Other tribes of Gaul traversed Eastern Europe and Asia Minor, ravaged Macedonia and Thessaly, passed through Thermopylæ, and pillaged Delphi. In B.C. 241, meeting with Attalus, King of Pergamus, they were driven back into the mountain district near the Halys River, and there they established the independent principality of Galatia, or Gallo-Græcia, which became a power among the peoples of Asia. This represents the first period of their history. The second is the history of their settlements in various parts of the world, and the development of their peculiar institutions, influenced as they were by environment and modified by the introduction of foreign elements. Thus in Phrygian Galatia the Gallic civilization was combined with those of Greece and Phrygia, and in Italy their manners and customs were affected by their contact with the Romans. Finally, in the struggle to maintain their freedom, they met the Romans on every side. As Thierry says: "The Gauls and Romans followed each other over the earth to decide the old quarrel of the Capitol." It was the long conflict between a ferociously active but undisciplined people and the sturdy, disciplined prowess of the Romans. The northern part of Italy, because of the early invasion of the Gauls, was termed by the Romans Gallia Cisalpina, i.e. 'Gaul this side of the Alps,' as viewed from Rome. This territory was also known as Gallia Citerior, to distinguish it from Gallia Transalpina or Gallia Ulterior. Here the contest was waged for centuries, the Romans gradually pushing their sway up to the Alps and establishing colonies in the Gallic towns.

Then the Romans passed over the Alps, invited by the people of Massilia (B.C. 154), who sought assistance against their neighbors; but the invaders did not cease to interfere with the affairs of Southern Gaul until the entire region

from the Alps to the Pyrenees became a Roman province. This was known as Gallia Provincia (Provence), and Narbo became the capital city. The wars of Julius Cæsar, which ended with the eighth campaign, in B.C. 50, in the conquest of Gaul, resulted in the formation of a new province, Aquitania. To this province was given the name Gallia Comata, or long-haired Gaul, just as Cisalpine Gaul had been termed Gallia Togata, and the old province Gallia Braccata, from the word *braccæ*, meaning the trousers (breeches) worn by the people. The third period in the history of Gaul dates from the time of Augustus, for in B.C. 27 Gaul became a part of the Roman Empire when that Emperor organized the peoples of Gaul in four provinces: Narbonensis, the old province; Aquitania, with the Liger (Loire) as the northern boundary; Lugdunensis, named from the town of Lugdunum (Lyons), between the Loire, the Seine, and the Saône; and Belgica, between the Seine and the Rhine, with the North Sea as the northern boundary. This division was not changed until the fourth century, when Gaul was divided into two great dioceses, the *diocesis Galliarum* and the *diocesis Viennensis*. The former was subdivided into eight provinces, and the latter into seven provinces. The Emperor Claudius did much toward the complete Romanization of Gaul, and later emperors completed what Augustus had begun. In the history of the Imperial period the Gauls had an important part; their fortunes rose and fell with the fortunes of the Roman people.

In the many contests of later Imperial times their land was the scene of fierce conflicts, and when the races of the north and east fought and overcame those of the south, their land was traversed again and again by great migrations of the Burgundians, Goths, and Franks, until out of the ruin there arose a new empire, and the history of mediæval and modern Europe began. See FRANCE.

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GAUL, ALFRED ROBERT (1837-). An English organist and composer, born at Norwich. He studied under Zechariah Buch, organist of Norwich Cathedral, from 1854 to 1859 was organist at Fakenham (Norfolk), and in 1859 was appointed organist of Saint Augustine's (Edgebaston), Birmingham. His works include an oratorio, *Hezekiah* (1860); two sacred cantatas, *Ruth* (1881) and *The Holy City* (1882), the latter of which has been very popular in the United States; a *Passion Service* (1882); an historical cantata, *Joan of Arc* (1887); and anthems and part-songs.

GAUL, GILBERT WILLIAM (1855-). An American painter, born at Jersey City, N. J. He studied under J. G. Brown, and was a pupil of the National Academy of Design, where he first exhibited in 1872. His works include: "Indian Girl" (1880); "Old Beau" (1881); "Charging the Battery," "News from Home"

(1882); "On the Lookout" (1885); and "Wounded to the Rear." He is at his best in his battle pictures, which are characterized by clever coloring and notable dash and spirit.

GAUL, goul, GUSTAV (1836-88). An Austrian historical genre and portrait painter, born in Vienna, where he studied for five years at the Academy under Rahl. After a visit to Italy he turned his attention particularly to the specimens of the Venetian School in the Dresden Gallery, and on subsequent journeys to France and Holland supplemented his studies from the works of Rubens and Rembrandt. He painted with predilection historical genre scenes, and as a portrait painter was much sought by members of the Imperial family, also by the foremost actors and actresses of Vienna. Among several other celebrities he portrayed Ludwig Spohr, Professor Hyrtl, and Sophie Schroeder. His copies after the old masters were held in great esteem. His brother FRANZ (1837—) painted some battle pieces, but gradually made himself indispensable as a designer of costumes and figures for the Imperial Opera and the Burgtheater.

GAULEY (gə'lé) **MOUNTAINS**. A portion of the mountain range in Pocahontas County, W. Va., which farther south becomes the Cumberland Mountains (q.v.). The name is also locally applied to mountains in Nicholas County, through which flows the Gauley River.

GAULEY RIVER. A river rising in the Gauley Mountains, Pocahontas County, W. Va. After a southwest course it unites with New River at Gauley Bridge, to form the Great Kanawha, a tributary of the Ohio.

GAULIN, gó'lán' (West Indian name). In Jamaica and the West Indies, a heron.

GAULS. See **GAUL**.

GAULT. A division of the Cretaceous system of England separating the Lower and Upper Greensands. It consists of a dark, plastic clay, sometimes sandy or marly, and attains a thickness of from 100 to 300 feet. It is exposed along the southeastern coast of England, one of the best sections being near Folkestone.

GAULTHERIA

(Neo-Lat. nom. pl., from *Gaultier*, a Canadian physician). A genus of low or trailing shrubs, belonging to the order Ericaceæ, a number of species of which occur in North and South America, Asia, Australia, and Tasmania. Among the best-known is *Gaultheria procumbens* (wintergreen), a common plant in evergreen woods from Canada to Georgia, especially in the mountainous districts at the south. It is also called checkerberry, deerberry, boxberry, partridge-berry, and mountain tea. The stems are trailing with ascending tips,



GAULTHERIA.

which bear the dark-green, smooth leaves and the scarlet berries. The foliage has the same flavor as that which characterizes the sweet birch (*Betula lenta*). The whole plant contains a volatile oil, oil of wintergreen, which is obtained by distillation. This oil is used to some extent in medicine as a stimulant, antiseptic, and diuretic, but its chief use is as a flavor. Other species, especially the Asiatic, are used as a source of the flavor. *Gaultheria shallon*, found from Alaska to California, is a shrub two or three feet high. It is known as 'salal,' and its black berries are edible. The fruits of wax-cluster (*Gaultheria hispidula*) and *Gaultheria antipoda* of Tasmania are edible, those of the latter being considered the better.

GAUNTLET, or **GANTLET**, gänt'lét (OF. *gantelet*, diminutive of *gant*, glove, from ML. *wantus*, glove, from Dutch *want*, OSwed. *wante*, glove, mitten). In mediæval armor, a glove usually of leather covered with iron, which formed part of the equipment of knights and men-at-arms. The back of the hand was covered with scale-work of plates joined together, so as to permit the hand to close. Gauntlets were introduced about the middle of the thirteenth century. They were often thrown down by way of challenge, like gloves. They were frequently used in heraldry, the fact of their being for the right or left hand being expressed by the words 'dexter' or 'sinister.'

GAUNTLET, EMILIA. The eminently virtuous sweetheart of Peregrine Pickle, in Smollett's novel of the latter name.

GAUNTLETT, HENRY JOHN (1805-76). An English organist and composer, born at Wellington. He studied law and practiced successfully, but at the same time devoted his leisure to the organ, holding numerous important positions as an organist. In 1836 he began the agitation in favor of substituting the C organ in place of the F and B organs. In this he was aided by the organ-builder William Hill, and the movement was finally successful. He also advocated the application of electricity to the action. Of his compositions, the best are his hymn tunes, though his chants and anthems are also excellent. He compiled numerous collections of hymns, most important being the *Comprehensive Tune Book* (1846-47); *Church Hymn and Tune Book* (1844-51); and the *Gregorian Psalter* (1846). He died at Kensington.

GAUPP, goup, GUSTAV (1844—). A German genre and portrait painter, born at Markgröningen, Württemberg. Preparatory to becoming a lithographer, he studied in Stuttgart, Vienna, and London, but turned to painting in 1870, as a pupil of the Academy at Munich, and, from 1873 on, of Piloty, whose brilliant coloristic treatment he adopted. To acquaint himself with the works of the old masters, he went to Italy in 1878, and after his return painted for a time chiefly portraits: in 1880-82 at Hamburg, then for two years in London, after which he settled at Stuttgart. A historical genre scene, "Sacking of a Convent by Lansquenets" (1876), is in the Gallery at Strassburg, and "A Game of Chess" (1895) in the Stuttgart Museum.

GAUR, gour, or **GOUR**. The mediæval capital of Bengal, situated on the arm of the Ganges called the Bhagirathi, in latitude 24° 52' N. and longitude 88° 10' E. According to tradition,

the city was founded in the twelfth century by Lakshmanasena of the Vaidya Dynasty of Bengal, who called it, after his own name, Lakshmanavati, or, in the vernacular, Lakhnauti. Lakhnauti continued for the most part to be the seat of rulers who governed Bengal and Behar, sometimes as confessed delegates to the Delhi sovereigns, sometimes as practically independent kings. From the year 1338, with the waning power of the Delhi dynasties, the Kingdom of Bengal acquired a substantial independence which it retained for more than two centuries. One of the earliest of the kings during this period, by name Ilyas Shah, transferred the seat of government (c.1350) to Panduah, a place about 16 miles north by east of Gaur. After some occasional oscillation, the residence was again (c. 1446) transferred to Gaur by Nasrud-Din Mahmud Shah I., by which name the city is generally known thenceforward, that of Lakhnauti disappearing from history. On account of its somewhat unhealthful situation, Suliman Kirani (1564-65) abandoned Gaur for Tandah, a place somewhat nearer the Ganges. Mu'umin Khan, a general of Akbar, when reducing these provinces in 1575, was attracted by the old site, and resolved to readopt it as the seat of local government. But a great pestilence (probably cholera) broke out at Gaur, and swept away thousands, the general-in-chief being himself among the victims. Gaur cannot have been entirely deserted, for the Nawab Shuja-ud-Din, who governed Bengal 1725-39, built a new gate to the citadel. The city is now in ruins, its remains being scattered over a vast area. Consult Ravenshaw, *Gaur: Its Ruins and Inscriptions* (London, 1878).

GAUR, gar or gour (Hind., from Skt. *gāura*, white). A wild ox (*Bos gaurus*) of India, probably the largest existing species of wild cattle, and the one hunted by Indian sportsmen under the misnomer 'Indian bison.' An old bull may stand six feet high at the withers, and specimens have been recorded whose horns measured 39 inches, and had a basal circumference of 19 inches; but the average is less than this; the cow is in every way smaller. The animal is massively built, with regularly upward-curving yellowish horns decidedly flattened at their base, and has a distinct ridge above the shoulders produced by great upstanding spines of the vertebræ. The ears are very large, the dewlap inconspicuous, and the tail comparatively short. In color, old bulls are dark brown, sometimes nearly black, with the crown of the head and the muzzle gray, and the lower parts of the legs pure white. The hair is fine and glossy. This grand animal is to be found in small bands throughout all the forested parts of India (except Ceylon) to the foothills of the Himalayas, and thence through the hilly districts of Assam and Burma down into the Malay Peninsula, where there are two forms, one called *sladong*, and the other *sapio*, in *Proceedings of the Zoological Society of London* (London, 1899). It roams widely, but keeps to the jungle, and is so alert and cunning in escape, and so formidable when brought to bay, that its chase is justly regarded as among the finest sports with a rifle in the world, and among the most dangerous, as it must always be pursued on foot. An old bull makes an even match for the tiger himself. Nevertheless, it is not pugnacious, and rarely or never attacks human beings

except when wounded or brought to bay, but shyly retreats from man whenever possible. These cattle have not been domesticated, except partially by some semi-wild hill tribes east of the Ganges in company with their gayals, who keep them as food. Consult: books of natural history and sport in India and Burma, especially Sanderson, *Thirteen Years Among the Wild Beasts of India* (London, 1893), noting that most of these writers call the animal 'bison'; also Blanford, *Fauna of British India: Mammals* (2 vols., London, 1888-91); Blanford, "On the Gaur and Its Allies," in *Proceedings of the Zoological Society of London* (London, 1890). Compare GAYAL; and see Plate of WILD CATTLE.

GAURISANKAR, gou'ri-sāp'kēr, MOUNT. See EVEREST, MOUNT.

GAUSS, gous, KARL FRIEDRICH (1777-1855). A German mathematician, one of the most brilliant mathematicians of modern times. He was born at Brunswick, the son of a day laborer. After three years (1792-95) in the Carolineum at Brunswick, he went to the University of Göttingen, where he remained from 1795 to 1798, devoting all of his attention to mathematics. When at Göttingen he was already in possession of the idea of least squares (see LEAST SQUARES, METHOD OF), and in March, 1796, he discovered the proposition that a circle can be divided into seventeen equal arcs by means of elementary geometry, the first extension of the ancient Greek knowledge in this particular. During his university career at Göttingen, he also worked upon his *Disquisitiones Arithmeticæ* (1801, 2d ed. 1889), a treatise which soon brought him into prominence before the scientific world. The German astronomers being unable to locate the planet Ceres, discovered by Piazzi at Palermo, January 1, 1801, Gauss invented a new method for calculating the position of heavenly bodies, and thus enabled Zach (December 3, 1801) and Olbers (December 4, 1801) to rediscover the planet. His *Theoria Motus Corporum Cælestium* (1809), vol. vii. of his *Werke* (1871; German by Haase, Hanover, 1865), completely established his reputation, so that Laplace recognized him as the first mathematician in Europe. The latter part of his life was devoted largely to two branches of applied mathematics, geodesy and electricity; he measured the meridian from Altona to Göttingen (1821-24), and he may be considered as the founder of the mathematical theory of electricity. With Weber he established telegraphic connection between the magnetic and the astronomical observatories at Göttingen (1833), and published the *Resultate aus den Beobachtungen des magnetischen Vereins* (6 vols., 1838-43), and the *Atlas des Erdmagnetismus* (1840). He also wrote on the theory of surfaces, least squares, and other subjects of mathematics, physics, and astronomy. His collected works were published by the Göttingen Academy (vols. i.-vi., Göttingen, 1863-74; vol. vii., Gotha, 1871; 2d ed., 8 vols., Göttingen, 1870-1900). For his life, consult Schering (Göttingen, 1887).

GAUSSEN, gō'sān', LOUIS (1790-1863). A Swiss Protestant theologian. He was born in Geneva, and in 1816 became pastor of Satigny, near that city. He held strongly to the old Calvinistic teachings, and refused to use a new and revised catechism which had been substituted for Calvin's. For this he was censured by

the majority of the Geneva ministers, and in 1832 was deposed by the consistory. In the same year, with Merle d'Aubigné and Galland, he formed the 'evangelical society' for the circulation of Bibles and tracts. In 1836 he became professor of theology in the new evangelical school at Geneva. He held to the verbal inspiration of the Scriptures in its most extreme form. Among his works translated into English are: *Theopneustics* (1841); *It is Written* (1856); *Lessons for the Young on the Six Days of Creation* (1860); *Canon of Scripture* (1862).

GAUTAMA, gou'tā-mā. The name of a family and of several individuals known in connection with the early Vedic literature of India. This appellative is a patronymic from Gotama, and was borne also by Buddha. (See GOTAMA.) It was especially preserved also as the name of an early Hindu teacher or lawgiver, the author of a work known as the *Institutes of Gautama*. These legal aphorisms, like the institutes of Apasamba, Baudāyana, and Vasishtha (q.v.), are important in connection with early Hindu law. For a translation, consult "Sacred Laws of the Aryans," in Müller, *Sacred Books of the East*, vol. ii. (Oxford, 1879 et seq.).

GAUTAMA BUDDHA, gou'tā-mā būd'ā. The great religious teacher and reformer of early India. His name is variously given. Its form as Gautama (q.v.) was a common appellative in ancient Sanskrit and appears in Pali as Gotama. It was a family designation, and for this reason the title Gautama Buddha is sometimes given in English as 'Buddha the Gotamid, or of the Gautama family.' Often he is called Sākya-muni, Sage of the Sākya Clan, as he was descended from this tribe, and frequently he is styled Siddhārtha, or, in Pali, Siddhartha, 'the one who successfully attains his aim.' The designation Buddha is an epithet and signifies the Enlightened One. Similarly Bodhisatva, or Pali Bodhisatta, means 'one who possesses the verity of knowledge,' and it is an attribute applied to each of a long line of Buddhas who have reached or will attain to perfect enlightenment and wisdom.

Buddha was born in the sixth century before the Christian Era, but the precise date is not known. His home was in the region of India to the northeast of Benares, and the town where he was born was Kapila-vastu, modern Kohāna, not far from the borders of Nepal. Tradition states that he was born in a garden sacred to the goddess Lumbini, and it is likely that the very place which the faith at least hallowed as his birthplace was discovered a few years ago by Alois Führer, but so many inaccuracies were connected with his identification of the column of Asoka, which marked the spot, that discredit has been thrown on the authenticity of the entire identification.

The name of Buddha's father is given in the sacred texts as Suddhodana, and his mother is known as Māyā in the Buddha-vamśa. It is generally thought that he was a prince of the royal blood, but this statement is not found in the oldest documents. For that reason doubt has, perhaps wrongly, been raised on this particular point. However that may be, the consensus of opinion is agreed that Siddhārtha's mother died when he was but seven days old, and that he was intrusted to the care of her sister, Mahā-

Prajāpati, of the Gotamid family. We know little that is authentic regarding his youth and education; but later tradition has woven a garland of legend about his youthful attainments and achievements, his talents and his virtues. A reflex of these Oriental descriptions may be gained from Sir Edwin Arnold's romantic poem *The Light of Asia*.

Prince Siddhārtha, if so we may style him before he attained to Buddhahood, was married, and had a son named Rāhula. It was shortly after the birth of this son, in his thirtieth year, when he had fulfilled the obligation which the Hindu creed required to be discharged to one's ancestors, that he left his wife, child, home, and kingdom, and wandered forth to take up the life of an ascetic. This was the method of procedure that the Brahman faith authorized; this was the manner of seeking the path of salvation. Finding his way to Rājagriha, he devoted himself to such rigorous and excessive asceticism that he nearly lost his life. Discovering that all this was idle and futile for him, he gave himself up solely to thought and meditation, which gradually led him to evolve his religious and philosophic theory of the general existence of evil, its origin, and its eradication. The place where the light dawned upon his soul is still pointed out. He was seated beneath a pipal-tree near the village that is now known as Buddh-gaya, to the southeast of Benares. The tree has ever since been sacred as the Bo-tree (q.v.). The emancipation of his spirit found expression in rhythmical stanzas, and he enjoyed at that moment, even while alive, the perfect peace of Nirvāna. To his enlightened eyes the cause of misery and sorrow was desire; the only relief was to pluck from the heart this lust, and to achieve this he pointed out the Eightfold Path of truth and right. See BUDDHISM.

After attaining the Buddhahip he proceeded to find the five ascetics with whom he had been associated in his recluse life near Benares. He wished to impart first to them the newly won joy and the solution of life's problems; after that to his family, kinsmen, countrymen, and to all mankind. Wandering up and down the Ganges region, the Holy Land of India, he continued to preach, and in parable, precept, and practice to impart the tenets of redemption. The purity of his life, the gentleness of his manner, the earnestness of his teaching, and the firmness of his conviction, won thousands upon thousands to accept his simple creed, and 'take refuge in Buddha.' Even during his lifetime his doctrines spread widely through India, and they became established in Ceylon hardly less than two centuries after his death. There is even a tradition, though not generally accepted, that Buddha himself twice visited the island. See Bo-TREE: CEYLON.

Much of Buddha's time was spent in founding monastic orders, and in developing lines along which the religion was destined in the future to grow. His life was a long one, eighty years, more than twoscore of which were devoted to his ministry. The time of his death is believed to have been about B.C. 480, but some latitude must be allowed for inaccuracy in the deductions. The place where he died was near Kusi-nagara, some 80 miles to the east of his birthplace, and about 120 miles to the northeast of Benares. A detailed account of the death

scene, even naming the disciples who were present, especially the beloved Ananda, is given in the Buddhist scriptures. Abundant incidents regarding Buddha's teaching and preaching may be gathered from the same sources. As to precise biography, in the strict sense of the term, there is none that is ancient, but the material may be collected from the Pali texts. The introduction to the Jātākas (q.v.), or book of birth stories, gives an account of the previous existences of the Buddha, and a sketch of his life down to his thirty-sixth year. The two Sanskrit metrical works entitled *Buddhacarita* and *Lalita Vistara* (q.v.) contain biographical accounts, but they are not earlier than the first and the second centuries of our era; while the Pali poem *Jina Carita*, 'Story of the Victorious One,' written in Ceylon, is as late as the twelfth century A.D., and the *Malalankara Watthu* is of uncertain date. But the continued publication of Pali texts, Tibetan writings, Chinese records, and Ceylonese accounts, is adding new information each year regarding the history of Buddha, of whose historical existence there is no longer any question, and fresh archaeological discoveries and researches are contributing extensively to the knowledge already gained. For bibliography, see **BUDDHISM**.

GAUTHERIN, gô'trân', JEAN (1765-1825). A French statuary, born in Paris. His first work of importance was "Narcisse au Bain," in plaster (1868). This was followed by numerous works in stone, bronze, and marble, such as "L'industrie des tissus," in the Palais de Trocadéro; "Le travail" (1884), in the Luxembourg Gardens; "La ville de Paris;" the façade of the Hotel de Ville; and "Portrait de femme," a marble bust in the Luxembourg Museum.

GAUTIER, gô'tyá', EMILE THÉODORE LÉON (1832—). A French paleographer and historian of literature, born at Havre. He was educated at Laval and at the Collège Sainte-Barbe, Paris, entered the Ecole des Chartres in 1855, and was appointed archivist in the national archives at Paris in 1859. In 1871 he was appointed professor of paleography in the Ecole des Chartres. He was made Chief Secretary of the National Archives in 1886, and was elected to the Institute in 1887. He is recognized as one of the greatest authorities on mediæval European literature, and his works on early French literature, in particular, are especially valuable. His numerous published works include: *Comment faut-il juger le moyen âge?* (1858); *Quelques mots sur l'étude de la paléographie et de la diplomatique* (1858); *Définition catholique de l'histoire* (1860); *Scènes et nouvelles catholiques* (1861); *Benoît II.* (1863); *Etudes historiques pour la défense de l'église* (1864); *Etudes littéraires pour la défense de l'église* (1865); *Epopées françaises* (2 vols., 1866-67); *Portraits littéraires* (1868); *La chanson de Roland* (1874), which won the Guizot prize in 1878; *Vingt nouveaux portraits* (1878); *La chevalerie* (1884); *Histoire de la poésie religieuse dans les cloîtres, des IXe et XIe siècles* (1887); *Portraits du XVIIIe siècle* (1888); and *Etudes et tableaux historiques* (1890).

GAUTIER, JUDITH (1850—). A French poet and historical novelist. She was born in Paris, the daughter of Théophile Gautier and the noted

singer Carlotta Grisi, was married to Catulle Mendès, but soon separated from him. She is an Oriental scholar, and her works deal mainly with Chinese and Japanese themes. Among them are: *Le dragon impérial* (1869); *L'usurpateur* (1875); *La femme de Putiphar*, a Persian romance (1884); and *La marchande de sourires*, a Japanese drama (1888).

GAUTIER, MARGUERITE. The name of an idealized courtesan, who is the heroine of *La Dame aux Camélias*, by the younger Dumas. By a quaint translation of sound rather than sense the name has been changed to "Camille" in the English adaptation.

GAUTIER, THÉOPHILE (1811-72). A noted French poet, critic, and novelist. Born at Tarbes, August 31, 1811, he went as a child to Paris, and was educated there. He showed special interest in the Latin of the Decadence and the French of the Renaissance, being attracted less by the normal than by the primitive or the over-refined. He became a painter, then a 'flamboyant' Romanticist, joining as a leader in the 'Battle of Hernani' (see HUGO), defying conventionality by his flowing hair and far-famed scarlet waistcoat. His poems of this period, *Premières poésies* (1830), and *Albertus* (1832), show a highly developed technic and a minute power of description. Then followed *Les Jeunes-France* (1832), stories of nonchalant irony, mocking alike romantic liberty and classic restraint. Gautier's next book, *Mademoiselle de Maupin* (1835), a curious attempt at self-analysis, was a frank expression of hedonism. Its art is fascinating, but it treats the fundamental postulates of morality with a contempt that closed the Academy to him for life. *Fortunio* (1837) is also frankly pagan. In 1836 Gautier put on the harness of journalistic criticism, embracing art and the drama, and his later works were, perforce, less offensive to the moralists. "They have made me a kennel," he writes in a poem of this time, "where I watch, pressed down in the feuilleton of a newspaper, like a crouching dog." The best of the short stories printed in 1845, *La morte amoureuse*, bears the date of 1836. The deadening effect of this hack work wore off in the fifties. He produced during this decade the masterful short stories, *Arria Marcella*; *Jettatura*; and *Avatar*; and the curiously antiquarian *Roman de la momie*. But none of these approaches in interest *Le capitaine Fracasse*, which had been announced in 1836 and appeared in 1861 and 1863 (2 vols.), as "a bill drawn in my youth and redeemed in middle life." It is a true classic of Romanticism, illustrating a minute knowledge of the epoch of Louis XIII. such as Gautier had already been showing in a series of literary studies, *Les grotesques* (1844). Several of his short stories had reflected a preoccupation with phantom love, and this was the subject of *Spirite* (1865), his last and least interesting novel.

In literary criticism Gautier's most significant works are his *Histoire du Romantisme* (1854), and his essays on Baudelaire and Lamartine. An important event in his life was his change from the staff of *La Presse* (1836-54) to the *Moniteur* (later the official journal of the Second Empire). Until his death he was a critic of authority in Paris, and exceptional for the charm of his paragraphs. These articles were assembled

in *Histoire de l'art dramatique en France* (6 vols., Paris, 1858-59). In these he inveighed against the classic and the bourgeois drama. Gautier was a great traveler for his time, and described his journeys in many books—*Voyage en Espagne* (1843); *Zigzags* (1845); *Italia* (1852); *Constantinople* (1854); *Loin de Paris* (1864); *Quand on voyage* (1865); *La Russie* (1866), etc. Some of these volumes—those on Italy and Spain, for instance—are still widely read, owing to his graceful, limpid language, and his fondness for discovering artistic effects.

His particular claim to fame, however, lies in his unique gifts as a poet as represented by his masterpiece, *Emma et Camécès*—a rather small collection of poems written between about 1850 and 1865. They are nearly all in geometrical stanzas of four lines and eight feet, and are distinguished for their impeccable daintiness, exhibiting Gautier's love of miniature effects and his adoration for the sculptural and for the color white. The volume is Parnassian rather than Romantic. In its pages there is no flesh and blood; life appears merely as plastic form and picturesque hue. The *Poésies* may be thought of perhaps as a French pendant to the little poems of Heine, and quite as exquisite in their way. Likely the most famous of them, and certainly as characteristic as any, is the one entitled *Symphonie en blanc majeur*. It celebrates the author's worship of the white, cold divinity of the passionless nude which forever torments him with its mute, sphinx-like messages of inert beauty.

Gautier was a connecting link between the Romantic and the Parnassian in France, uniting in his pages the pictorial exotic with the pagan plastic, in accordance with his celebrated saying: "I am one for whom the visible world exists." In treating his soulless images he employed with the accuracy of a true artist a vocabulary famed for its rich resources. For forty years he was one of the interesting and conspicuous figures of the Paris literary and art world. A somewhat grotesque personality, he wore by preference the mask of a grave stoic in a sort of relaxed hopeless attitude toward his impecunious destiny. He detested the necessities and ordinary duties of life. When he spoke, it was to give utterance to some memorable remark or resigned witticism, or to indulge in a droll monologue composed of the sublime and the absurd. He was a cosmopolitan, remarkably open for a Frenchman to foreign influences. Loving and extolling the beautiful wherever he observed it, he was the champion of all unknown persons or newcomers who had anything pleasing to offer the Parisian public. He died in Paris, October 23, 1872.

Consult: *The Works of Gautier* as edited in English by Sumichrast (24 vols., Boston, 1900 et seq.); the monographs by Baudelaire (Paris, 1859); Feydeau (ib., 1874); Bergerat (ib., 1878); Du Camp (ib., 1890); and Richet (ib., 1893); also Sainte-Beuve, *Nouveaux lundis* (ib., 1863-72); Spoelberch de Lovenjoul, *Histoire des œuvres de Théophile Gautier* (ib., 1887); Brunetière, *Evolution de la poésie lyrique* (ib., 1894), and Faguet, *XIXe siècle* (ib., 1894).

GAUTIER DE COSTES, gô'tyá' de kôst. See LA CALPRENÈDE.

GAUTING, gou'ting. **EREMIT VON**. See HALLBERG-BROICH, THEODOR M. H.

GAUTSCH VON FRANKENTHURN, gouch fôn frâpk'en-töörn, PAUL, Baron von (1851—). An Austrian statesman, born and educated in Vienna. After holding various offices in the governmental service, he was employed (1874) in the Ministry of Education, and in 1885 became its chief. He was made a baron in 1890, but three years later was forced to resign. Minister of Education under Badeni (1895), he became Prime Minister two years later, and retained the Department of Interior until March, 1898, when the German opposition to his Bohemian policy was so strong that his Cabinet resigned.

GAUZE (Fr. gaze, ML. *gazzatum*; probably of Eastern origin; cf. Pers. *gazi*, thin, coarse cotton cloth, less probably from the Syrian city of *Gaza*). A light transparent fabric, originally made of silk. The openness of texture is obtained by crossing the warp threads between the threads of the weft, so that the weft passes through a succession of loops in the warp, and the threads are thus kept apart, without the liability to sliding from their places, which would take place if simple weaving were left so loose and open. Large quantities of medicated and antiseptic cotton gauze are used by surgeons. *Bolting cloth* is a gauze made of unsized silk for separating the products of a flour-mill. (See FLOUR.) Fine wire cloth is called *wire gauze*. The term is also applied to light woven fabrics of silk, linen, or cotton, such as are used in the manufacture of summer underwear.

GAVARNI, gâ'vár'né' (1804-66). A noted French caricaturist and illustrator of great originality and verve, an historical satirist of inexhaustible inventive power who portrayed types of French character, and in particular the various phases of Parisian life. His real name was Guillaume Sulpice Chevallier, and he was born in Paris, January 13, 1804. When a mere boy he was placed with an architect, then at the age of thirteen was apprenticed to a maker of mathematical instruments, and two or three years later studied mechanical drawing at the Conservatoire des Arts et Métiers. This was all the artistic training he ever received. In 1825 he was sent by one of his patrons to draw and engrave the bridge at Bordeaux, for which he was to receive 1200 francs a year, but finding the employment uncongenial, he threw it up before the year was out, and wandered about for some months, apparently without aim. By a lucky chance he found a benefactor at Tarbes in M. Leleu, the superintendent of the Cadastre in the Pyrenees, who gave him employment and made him at home in his family, until an offer of regular work took him back to Paris in 1828. In 1829 he adopted his *nom de guerre*, derived from the beautiful valley of Gavarnie in the Pyrenees. In 1830 he made the acquaintance of Emile de Girardin, who invited him to make the designs for *La Mode*, and it was in its office that he met Balzac, who, shortly after, asked him to illustrate his *Peu de chagrin*. Other papers also had the aid of his pen and pencil, and theatrical tailors and costumers found in him a valuable assistant, but his greatest success was as a satirist of the dandyism of the day. With the year 1832 the period of uncertainty came to an end, and from that date he could count upon an appreciative and faithful public. Two years

later he founded the *Journal des Gens du Monde*, of which he was at once editor and illustrator, and to which he contributed verse and prose, illustrating both with charming drawings. The undertaking proved unprofitable, and after struggling through six months of existence, landed its parent in the debtor's prison at Clichy. While, restored to liberty, he was hesitating as to his future course, he received a liberal offer from the proprietor of the *Charivari*. Modifying the publisher's idea, the artist produced the series of drawings known as "Les fourberies de femmes en matière de sentiment," which was soon followed by "La boîte aux lettres." Illustrating the Bohemian world in which he lived, series after series flowed from his pencil, all instinct with vivacity and force, and drawn mostly from the shady side of Paris life, like "Les lorettes," "Les coulisses," "Le carnaval," "Les étudiants," "Les débardeurs," etc., while later he embodied in other series his studies in superior strata of society, as in the well-known "Les enfants terribles," and in "La politique des femmes," "Impressions de ménage," "Nuances et sentiments," and others.

In 1844 he married Jeanne de Bonabry, but the union did not prove happy, and three years later he went to London. He returned in 1852, so deeply impressed by the scenes of degradation and wretchedness he had witnessed that it seemed to color all his future work, and it is said that he never laughed again nor made others laugh. He continued the practice of his art, but his tone was sterner, and his satire became more biting. Some of the series of this last period exhibit his tendency to be a moralist, as may be noticed in "Les partageuses," "Les lorettes vieilles," and "Les propos de Thomas Virelogue." During his last years he inclined more and more toward scientific pursuits, and passed most of his time in his garden at Auteuil with his two boys, continually changing its aspect, and never finishing the new design. He died there, November 24, 1866.

The *Catalogue raisonné de l'œuvre de Gavarni*, issued by Armelhaut and Bocher (Paris, 1873), conveys an adequate idea of the extraordinary amount of work performed by this unique prince of the pencil. In the Bibliothèque Nationale, Paris, his drawings fill fifteen folio volumes, but they represent little more than half of his work. For his biography, consult: Duplessis (Paris, 1876); Goncourt (ib., 1879); and Forgues (ib., 1888); also Mirecourt, *Les contemporains* (ib., 1854); Beraldi, *Les graveurs du XIX^{ème} siècle* (ib., 1888); and Curtis, *Masters of Lithography* (New York, 1897).

GAVARNIE. A frontier village in the Department of Hautes-Pyrénées, France, on the Gave-de-Pau, 34 miles south of Tarbes. The village originated in a hospital of Knights Templars, and is famous for the Cirque de Gavarnie, three miles to the south, a natural amphitheatre, nearly nine miles in circumference, surrounded by three ranges of limestone mountains, rising respectively to an altitude of 6900, 8500, and 9000 feet, the intermediate slopes being covered with glaciers. Thirteen cascades fall into the Cirque, the principal one, the Cascade de Gavarnie, fed by the Gave-de-Pau, having a drop of 1385 feet. Population, in 1901, 269.

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GAVAZZI, gá-vât'sé, ALESSANDRO (1809-89). A popular Italian preacher and reformer. He was born at Bologna, became a monk of the Barnabite Order in 1825, and in 1829 professor of rhetoric at Naples. He entered the priesthood and acquired great reputation as an orator and advocate of liberal ideas. In 1840 he was transferred to Rome. He was one of the foremost supporters of the liberal policy that marked the beginning of the pontificate of Pius IX., and was prominent in the patriotic movements of the time. When Rome was captured by the French (July, 1849), he escaped to England, and lectured in that country and in Scotland. He also visited the United States and Canada, where his reception was not always favorable. In 1850 he renounced Catholicism, and became pastor of an Italian church in London. In 1860, having returned to Italy, he accompanied Garibaldi in the campaign of that year. After the battle of Mentana (1867) he devoted himself entirely to the Free Church of Italy, which he organized in 1870. He established a theological school of the Church at Rome in 1875, and became its professor of dogmatics, apologetics, and polemics. He made his last visit to America in 1881. He died in 1889. He published: *Orations* (London, 1851); *Recollections of the Last Four Popes* (London, 1859); *Records of Two Years' Christian Work in Italy* (London, 1868). For his life, consult: King (London, 1860); *Lectures in New York*, with life by Campanella and Nicolini, corrected by himself (New York, 1853).

GAVELKIND (Ir. *gabhail-cine*, from *gabhail*, tenure + *cine*, family). An ancient form of tenure in England, which antedated the Conquest, and which, in the county of Kent and in some parts of Northumberland and Wales, survived the coming and the disappearance of the feudal system. Its principal characteristic was the fact that the lands so held passed by descent to all of the sons of the tenant equally, instead of going, under the feudal rule of primogeniture, to the eldest son alone. Though Blackstone, probably with reason, ascribes a Celtic origin to this tenure, it seems to be the general opinion of English legal writers that it prevailed over the whole kingdom in Anglo-Saxon times, and that in Kent and elsewhere it was among the 'liberties' which the people were permitted to retain at the Conquest. In Wales gavelkind obtained universally till the time of Henry VIII. (34 and 35 Henry VIII., c. 26), and in some parts of England it is not yet abolished. In Kent all lands that have not been disgavelled by act of Parliament are held to be gavelkind. In addition to the characteristics of this tenure already noticed, Blackstone mentions the following: (1) The tenant is of age sufficient to alien his estate by feoffment at the age of fifteen. (2) The estate does not escheat in case of an attainder for felony, their maxim being, "the father to the bough, the son to the plow." (3) In most places the tenant had a power of devising lands by will before the statute authorizing the devise of lands generally was made. See **TENURE**, and consult Blackstone, *Commentaries*, and the authorities cited under **TENURE**.

GAVESTON, PIERS, Earl of Cornwall († 1312). The favorite of Edward II., King of England. His father was a Gascon knight attached to the royal household of Edward I. Here, from an early age, Piers was a companion of the heir

apparent, who, on his accession to the crown, created him Earl of Cornwall. He was witty and clever, but unscrupulous in the pursuit of his ambitious designs. Presuming on the King's regard for him, his attitude toward the English barons was of such a nature as to excite their enmity. His nomination as regent of the kingdom during the royal absence in France in the early months of 1308, and the honors conferred upon him at the coronation in the same year, aroused the open hostility of the barons, in compliance with whose demands the King was forced to send Gaveston out of the kingdom, making him, however, Lord Lieutenant of Ireland. In July, 1309, he was recalled, and, firm in the King's favor, grew more insolent than ever. This led Parliament to insist upon his banishment in October, 1311. In less than two months, however, he returned, and was reinstated in royal favor, whereupon the barons rose in arms, besieged Gaveston in Scarborough Castle, captured him, and beheaded him on Blacklow Hill, near Warwick, on June 10, 1312.

GA'VIAL, or **GHARIAL** (from Hind. *ghariyal*, fish-eater). A fish-eating crocodile of Northern India (*Gavialis Gangeticus*), differing from true crocodiles and from alligators in the great length and slenderness of the muzzle, and the cartilaginous swelling at its extremity (in old males) around the orifice of the nostrils by which it may be largely inflated. The teeth are very numerous, about 120; the longest of the lower jaw are received into notches in the upper, as in the true crocodiles. The head is broad, the narrow muzzle begins abruptly, and in it the branches of the bone of the lower jaw are united and prolonged as one. There are two great perforations in the bones of the skull behind the eyes, externally marked by depressions. The plates which cover the back and the nape of the neck are united. The crest of the tail is much elevated; the feet are webbed to the extremity of the toes. Its habits are as aquatic as those of the crocodile of the Nile. It attains a great size, but, owing to the slenderness of its muzzle, is esteemed less dangerous than a true crocodile of smaller size. The genus dates from the Upper Chalk period. See CROCODILE.

GAVINIÉS, gá'vé'nyá', **PIERRE** (1726-1800). A French violinist and composer. He was born at Bordeaux, and was a self-taught musician. When only fifteen he made his début at a "concert spirituel," an enterprise which he in part projected. His success was immediate; Viotti, hearing him play, remarked that he was *le Tartini de la France*. From 1795 until his death he was professor of the violin at the Paris Conservatory. His style is said to have been formed upon that of the old Italian masters, and was remarkable for its expressive and sympathetic qualities. He was of greatest importance in the development of violin technique in France, where he is considered the founder of the modern school of violin-playing. His compositions for the violin are for the most part very difficult, and comprise *Les vingt-quatre matinées*, six violin concertos, and nine violin sonatas. He also composed a three-act comic opera, *Le prétendu* (1760), which met with considerable success. He died at Paris.

GAVIOTA (Neo-Lat., from Lat. *gavia*, sort of bird, probably a sea-mew). A species of gull

(*Larus cirrocephalus*), very familiar about the harbor of Buenos Ayres and neighboring parts of South America. Consult *Proceedings of the Zoological Society of London* (London, 1871).

GAVOTTE, gá-vôt'. A French dance, whose name is derived from the *Gavots*, a people inhabiting the Pays-de-Gap, in Dauphiné. Originally a peasant dance, it was introduced at Court in the sixteenth century, and was largely remodeled in the seventeenth and eighteenth centuries. Its distinctive feature consisted of the performers raising their feet clear of the ground, instead of shuffling along, as was usual in dances of this character. Kissing and merry-making played a great part in the old gavotte, but subsequently it became almost as stiff and formal as the minuet. As a theatrical dance the gavotte was effective and popular. Glick and Grétry in particular having written famous ones. The music is in alle-breve time; in two parts, the first of four, the second of eight bars, and each part is repeated. As each phrase begins with an up beat, the fundamental rhythm of the gavotte is



by which the second bar has a remarkable cæsura. Some of Bach's suites contain excellent examples of the gavotte. It generally commences on the third beat of the bar, though this rule is not without its exceptions. See SUITE.

GAVRE, gá'vr'. A small town in Belgium, near Ghent. In 1453 it was the scene of a crushing defeat of the citizens of Ghent by Philip the Good, Duke of Burgundy.

GAUVROCHE, gá'vròsh'. A street urchin in Victor Hugo's *Les Misérables*, so typical of his class as to have well-nigh given his name to it.

GAWAIN, gá'wán, **SIR**. One of the knights of the Round Table. He is the nephew of King Arthur (q.v.), and his ally in the war with Launcelot. He tries in vain to pull the magic sword from the magic stone, fails in the quest of the Holy Grail (q.v.), and dies from wounds received in a fight with Launcelot. Consult: Malory, *Morte d'Arthur*; and Tennyson, *Idylls of the King*. The name is also given to a knight in *Amadis of Gaul*.

GAY, gá, **CLAUDE** (1800-73). A French traveler and naturalist, born at Draguignan, France. He pursued scientific studies primarily in Paris, and after a few months' travel in Greece and Asia Minor, sailed, in 1828, from Chile with the intention of making an extensive study of the flora of the South American continent. With the exception of a short period in 1832-33, which he spent in Paris supervising the construction of some scientific instruments of his own invention, Gay remained in South America until 1843, making extensive researches in Chile and parts of Peru, and collecting a great mass of material, not only in regard to the flora of the country, but its physical characteristics and political history as well. In 1843 he returned to Paris, where, by means of financial aid furnished by the Chilean Government, he was enabled to publish (in Spanish) his monumental *Historia física y política de Chile* (24 vols., 1843-51, with an atlas in 2 vols.). Gay spent 1856-58 in travel in Russia and the Orient, and in 1858 was commissioned by the Academy of Sciences, of which he

had been elected a member, to study mining in the United States, the results of his investigations being incorporated in an interesting work entitled *Rapport à l'Académie des Sciences sur les mines des Etats-Unis* (1861). Among his other publications were: *Consideraciones sobre las minas de mercurio de Andacolla é Iltapel con su posición geológica* (1837); *Origine de la pomme de terre* (1851); *Triple variation de l'aiguille aimantée dans les parties ouest de l'Amérique* (1854); *Carte générale du Chili* (1855).

GAY, DELPHINE, Madame de Girardin (1804-55). A French novelist and miscellaneous writer. She was born at Aix-la-Chapelle, the daughter of Sophie Gay (q.v.), and in 1831 became the wife of Emile de Girardin (q.v.). Of her numerous but ephemeral productions a comedy, *La joie fait peur*, and a novel, *Le lorgnon* (1831), are sufficiently typical. She died in Paris.

GAY, EDWARD (1837—). An American painter, born in Dublin, Ireland. He studied under James Hart at Albany, N. Y., and afterwards in Germany, first under Schirmer at Karlsruhe, and then under Lessing at Düsseldorf. His well-known landscape "Broad Acres" was awarded a prize of \$2000 by the American Art Association, and was given by it to the Metropolitan Museum of Art in New York City in 1887. Other works by him are "Rye Fields in Early June," and "Salt Marshes" (1885), both in water-color.

GAY, JOHN (1685-1732). An English poet and dramatist, born in 1685 at Barnstaple, Devonshire, of an ancient but impoverished family. After attending the free grammar-school he was apprenticed to a London mercer, but, dissatisfied with the occupation, he soon abandoned it. In 1712 he was appointed secretary to the Duchess of Monmouth. He had already written "Wine" (1708), a poem in blank verse; and a pamphlet entitled *The Present State of Wit* (1711), which gives an account of the current periodical literature. In 1713 he published a poem descriptive of country life, called "Rural Sports." It was dedicated to Pope, whose acquaintance Gay had made two years before. Now under Pope's influence, he produced *The Fan* (1714) and *The Shepherd's Week* (1714), a series of pastorals aimed against Ambrose Philips. Appointed secretary to Lord Clarendon, Envoy to Hanover, he was abroad in the summer of 1714. Returning to England in September, he addressed an epistle to the newly arrived Princess of Wales (October). His next production was a farce in ridicule of popular tragedies, entitled *What-d'-ye-Call-It* (1715). It contains the famous song, "'Twas when the seas were roaring." Next came *Trivia* (1716), descriptive of outdoor life in London. This was followed by an unsuccessful comedy, *Three Hours After Marriage* (1717). Three years later he published a collection of his poems with additions, by which he cleared \$1000. Here first appeared his finest ballad, "Sweet William's Farewell to Black-ey'd Susan." Entering into the South Sea speculations (1720), he lost everything, and became dependent on his friends, the kindest of whom were the Duke and Duchess of Queensberry. In 1724 he produced for Drury Lane Theatre the tragedy of *The Captives*, which met with some success. Three years later came the

popular verse-tales entitled *Fables*, the best of their kind in English. Gay was yet to gain his great fame. His Newgate pastoral, the *Beggar's Opera*, was first performed at Lincoln's Inn Fields, January 29, 1728. It ran for sixty-three days, was revived the next season, and performed in all the great English towns. Gay wrote a sequel entitled *Polly*, which was prohibited; but it succeeded remarkably in book form. Gay died December 4, 1732. A second series of *Fables* appeared posthumously (1738). The *Fables*, with memoir, were edited by Dobson (London, 1882); and the *Poetical Works* by Underhill (London, 1893). Consult: Johnson, *Lives of the Poets* (London, 1854); and Thackeray, *English Humorists* (London, 1853).

GAY, gâ, SOPHIE NICHULT DE LALETTE (1776-1852). A French novelist, born in Paris, July 1, 1776. Her novel *Laure d'Estell* (1802) has a sort of biographical interest, for it was written to indicate how much the author liked Madame de Staël and disliked Madame de Genlis. *Léonie de Montbreuse* (1813), *Anatole* (1815), and *Ellénore* (1847) are sufficiently characteristic of her other works. She died at Brussels, March 5, 1852.

GAY, SYDNEY HOWARD (1814-88). An American journalist and historian. He was born in Hingham, Mass., studied for a time at Harvard, then traveled, worked in a counting-house in Boston, and afterwards studied law, but became an abolitionist, and was precluded from practicing by his refusal to take the oath to support the Constitution. He became a lecturing agent for the American Anti-Slavery Society in 1842, and the editor of the *National Anti-Slavery Standard*, the official organ of the society, in 1844. He accepted a position as an editorial writer on the *New York Tribune* in 1842, and from 1862 to 1866 was its managing editor. Subsequently he was managing editor of the *Chicago Tribune* from 1868 to 1871, and an editorial writer on the *New York Evening Post* from 1872 to 1874. Though nominally only a collaborator, he actually wrote nearly the whole of Bryant and Gay's *Popular History of the United States* (1876-80), a work whose comprehensiveness, clearness, and accuracy soon gave it a high rank among compendiums of American history. He also wrote a *Life of Madison* (1884) for the "American Statesmen's Series;" the chapter on Amerigo Vespucci in Winsor, *Narrative and Critical History of America* (1886-89); and many articles on historical subjects for the magazines.

GAY, WALTER (1856—). An American painter, born at Hingham, Mass. He was a pupil of Bonnat in Paris, and in 1880 became a member of the Society of American Artists. His "Fencing Lesson" was exhibited at the Salon of 1879, and "The Spinners" received honorable mention in 1885. "Le Bénédicité," his best picture, was bought by the French Government for the Luxembourg. He received the decoration of the Legion of Honor in 1894, and a silver medal at the Paris Exposition of 1900.

GAY, WINCKWORTH ALLAN (1821—). An American landscape painter, born at Hingham, Mass. He studied under Robert Weir at West Point and Troyon in Paris. After 1877 he spent many years abroad. His pictures of New England scenery are the best of his works, and among

these may be especially mentioned the "Mackerel Fleet Off Beverly Coast" (1869).

GAYA, gī'a, or **GYA**. The capital of the District of Gaya, in the Presidency of Bengal, British India, on the Phalga, an affluent of the Ganges, 57 miles south of Patna, by rail (Map: India, E 4). A place of great sanctity, being the birthplace of Buddha, it is annually visited by thousands of pilgrims. It consists of the old native town, Gaya proper, and Sahibganj, the modern European and trading quarter. Of its many shrines and temples the most important is the Temple of Vishnu, crowned by an octagonal pyramid over 100 feet high. Its public institutions include a well-attended high school and a hospital with a branch for women. Population, in 1891, 80,400; in 1901, 71,200. Buddha Gaya, seven miles to the south, the ancient dwelling-place of Buddha, is the seat of a famous temple, which dates from B.C. 543, and has a pipal-tree, the descendant of the one under which the saint attained Nirvana.

GAYAL, gī'al (probably from Skt. *gaya*, household), or **MITHAN**. A species of native cattle (*Bos frontalis*), closely related to the gaur, which has long been more or less domesticated among the hill tribes of Northeastern India, and thence eastward through Assam to the Chinese borders, where it is known as *mithan*. It was formerly considered a race of the gaur (q.v.), but is now known to be a distinct species, which Blanford asserts to exist wild in Tenasserim. It resembles the gaur, but is of less size, has proportionately shorter limbs, less of a ridge on the back, and the horns shorter and less compressed at the base. The head is very broad and flat at the upper part, suddenly contracted toward the nose, with a very wide space between the horns. The prevailing color is brown, generally dark, but in some of the herds parti-colored and white ones are frequently seen. The Keskis, of Tipperah, and other eastern hill tribes keep herds of gayals, which they permit to roam at large during the day in the forests, but which return home at night of their own accord. Their milk is extremely rich, but not abundant; the natives, however, do not use the milk, but rear these cattle entirely for their flesh and skins. They are never used in agricultural labor nor as beasts of burden; and though occasionally interbred with captive gaurs, have given rise to no domestic race. Beyond the fact that it is, like the gaur, an inhabitant of the forests, and is surprisingly agile among rocky hills, nothing is known of the habits of the gayal in a wild state. See Plate of WILD CATTLE.

GAYANGOS Y ARCE, gī-ān'gōs é ār'thā, PASCUAL DE (1809-97). A Spanish historian. He studied at Madrid and later in France; held office under the Spanish Government (1833-36), then lived for a time in London, where he translated into English Al Makkari's *History of the Mohammedan Dynasties* (1840). He became professor of Oriental languages at the University of Madrid, and in 1881 Director of Public Instruction. Resigning soon afterwards, he spent much of his time in London. The historian Prescott, in his preface to *Ferdinand and Isabella*, acknowledges the valuable services of Señor de Gayangos, and he repeats these acknowledgments in his *Philip II*. He refers particularly to the remarkable facility of Gayangos "in deciphering the

mysterious handwriting of the sixteenth century," with which "he combined such a thorough acquaintance with the history of his country as enabled him to detect, amid the ocean of manuscripts which he inspected, such portions as were essential to my purpose." Among his works are: *Historia de los reyes de Granada* (1842); a Spanish edition of Ticknor, *History of Spanish Literature*; *Cartas y Relaciones de Hernán Cortés al Emperador Carlos V.* (1870), and many contributions to periodicals.

GAYARRÉ, gā'ür-rā', CHARLES ETIENNE ARTHUR (1805-95). An American historian. He was born at New Orleans, La., January 9, 1805, was educated in the College of New Orleans, studied law in Philadelphia, and was admitted to the bar in 1829. Returning to New Orleans, he was soon made a member of the Legislature, Deputy Attorney-General of the State, and presiding judge of the New Orleans City Court. In 1835 he was chosen United States Senator, but on account of ill health did not serve, and spent the next eight years in Europe. After his return he was twice again elected to the Legislature, and was for seven years (1846-53) Secretary of State for Louisiana, doing much for the State Library and for local historical studies. He was in favor of secession, and advocated the emancipation and arming of the slaves. But although a prominent figure of the public life of Louisiana, his main bent was literary, and in the course of his long life he published many volumes, including some romances and dramas. He is best known, however, as the historian of his State. He died in New Orleans, February 11, 1895. Among his books we may cite: *Histoire de la Louisiane* (1847); *Romance of the History of Louisiana* (1848); *Louisiana, Its Colonial History and Romance* (1848-52); *Louisiana, Its History as a French Colony* (1851); *History of the Spanish Domination in Louisiana* (1854); and *Philip II. of Spain* (1866). The complete *History of Louisiana* appeared, in 1866, in four volumes. His romance *Fernando de Lemos* gives an interesting picture of old New Orleans.

GAYER, gī'ēr, KARL (1822—). A German forester, born at Speier. In 1855 he was appointed professor of forestry at Aschaffenburg, whence he was in 1878 called in the same capacity to the University of Munich. In his work entitled *Der Waldbau* (4th ed. 1898), he introduced a new method of instruction in forestry, based upon a stricter adherence to natural laws. His manual of forestry, entitled *Die Forstbenutzung* (8th ed. 1894), is the authority on that subject in Germany. Other works by the same author are: *Wald im Wechsel der Zeiten* (1889), and *Der Femeischlagbetrieb in Bayern* (1895).

GAY HEAD. See MARTHA'S VINEYARD.

GAYLEY, CHARLES MILLS (1858—). An American author. He was born at Shanghai, China, and was educated in England, at the University of Michigan (1878), and at Giessen and Halle, Germany. In 1880 he became associated with the University of Michigan, where he remained as assistant professor of Latin until 1889, when he accepted a call as professor of English in the University of California. His publications include: *Representative English Comedies* (5 vols.; vol. i., 1901); *Classical Myths in English Literature* (1893); *Methods and Ma-*

serials of Literary Criticism (with F. N. Scott, 1899).

GAY-LUSSAC, gä' lu'säk', JOSEPH LOUIS (1778-1850). One of the most distinguished chemists and physicists of the nineteenth century. He was born at Saint Léonard le Noblat (Haute-Vienne). In 1794 he was sent to Paris, and was admitted to the Ecole Polytechnique in 1797. After three years' study, Berthollet, who was then professor of chemistry in the Ecole Polytechnique, selected him as his assistant at Arcueil, where the Government chemical works were situated. In 1801 the young chemist published his first memoir, which treated of the dilatation of gases and vapors, and which was speedily followed by others, on the improvement of thermometers and barometers, on vapor-tensions and the determination of vapor-densities, and on capillary action. In association with Biot, he was commissioned by the Institute of France to make a balloon ascent, with the view to ascertaining whether magnetic force existed at considerable heights above the surface of the earth, or only on the surface, as had been asserted by some physicists. Alexander von Humboldt investigated with him the properties of air brought down from a height of more than 23,000 feet, and their joint memoir to the Academy of Sciences (read on October 1, 1804) contained the first announcement of the fact that oxygen and hydrogen unite to form water in the simple proportion of one volume of the former to two volumes of the latter. The simplicity of the ratio in which these gases stood to each other in their combining proportions induced Gay-Lussac to study the combining volumes of other gases, and thus led him to the important discovery of the law of volumes, which was announced in 1808, and is one of the most general and important laws in the whole domain of chemistry. In 1809 he was made professor of chemistry at the Ecole Polytechnique. Davy's discoveries of potassium and sodium, by the decomposing action of the electric current, having excited much attention in France, Napoleon directed Gay-Lussac and Thénard to pursue this class of researches. The results of their investigations appeared in two volumes, under the title *Recherches physico-chimiques*, in 1811. Among the most important of the discoveries announced in these volumes were a new chemical process which yielded potassium much more abundantly than the electrolytic method, the isolation of boron, and new and improved methods of analyzing organic compounds. Gay-Lussac was also the first to obtain hydriodic and iodic acids and cyanogen. He also investigated the manufacture of hydrated sulphuric acid, bleaching chlorides, alcohols, and alkalies employed in commerce. In 1805 he was chosen a member of the Committee of Arts and Manufactures, established by the Minister of Commerce. In 1818 he was appointed to superintend the Government manufactory of gunpowder and saltpetre, and in 1829 he received the lucrative office of chief assayer to the mint, where he introduced several important improvements. In 1831 he became a member of the Chamber of Deputies; in 1832 professor of chemistry at the Jardin des Plantes; and in 1839 he was made a peer of France. He never took an active part in politics, and was diligently engaged in scientific research until his last illness. From 1816

he was co-editor of the *Annales de chimie et de physique*, in which many of his original memoirs were published. He also wrote: *Cours de physique* (1827); *Leçons de chimie* (2 vols., 1828); and other works. Consult: *American Journal of Science* (1850); Biot and Gardeur le Brun, *Notices biographiques sur Gay-Lussac* (Châlons, 1850). See CHEMISTRY; AVOGADRO'S RULE.

GAY-LUSSACIA. A genus of shrubs of the natural order Ericaceæ (q.v.), named after the French chemist J. L. Gay-Lussac. The species, of which about 40 are natives of North and South America, bear alternate serrate or entire leaves, racemes of red, white, or reddish-green flowers, and black or blue, generally edible fruits. Some species are deciduous, some evergreen. The former, though hardy, are not markedly ornamental; the latter are nearly all attractive in both foliage and flower, but little cultivated in cold countries, on account of their tenderness. Like their close relatives, the species of *Vaccinium*, they thrive in peaty or sandy soils and in partial shade.

GAYN'HAM, or **GARN'HAM**, Dr. One of the most lax of the degraded clergymen who, while confined as prisoners in the Fleet, performed secret marriages in the eighteenth century. He claimed in court to have lent himself to 2000 such marriages. He is described as a lusty man, and is also called the "Bishop of Hell."

GAY SABER, gä sä'bar'. A small association or committee, originally known as "The very gay company of the seven troubadours of Toulouse," which met first in 1324 at Toulouse. Its object was the restoration of the Provençal language and customs, and the rules which it adopted are still in force in the annual floral games held at Toulouse on May 1st.

GAZA, gä'zä. A city in Southern Syria, the modern Ghazze, three miles from the Mediterranean coast, and about 50 miles southwest of Jerusalem. It was once the most important member of the Philistine Pentapolis, and a flourishing centre of Hellenistic culture, and is still an emporium of trade and a place of considerable size, with a population of about 35,000. Gaza is mentioned as Gazatu in a list of places in Palestine captured by Thothmes III. It is referred to in the Amarna correspondence under the form Khazati. In the time of Rameses II. it was still an Egyptian possession. But the Philistines seem to have secured the city when they were repelled in their attack upon Egypt in the reign of Rameses III. Probably the city was not captured by the tribe of Judah at the time of the Hebrew invasion, as stated in Judges i. 18, since the editorial gloss contradicts the context. In the narrative of Samson (q.v.), Gaza figures prominently, and he is said to have carried away the gates of this city (Judges xvi. 3). The Assyrian inscriptions do not mention the city until the reign of Tiglathpileser III. (B.C. 745-728), when 'Chanun, King of Gaza,' resisted his attacks, was defeated, and fled to Miluchha in B.C. 734. In B.C. 720 this King again offered resistance, aided by Sibe, King of the north Arabian country of Muzri. Sargon defeated him at Rahpia and carried him and 9000 of his people away into captivity. Gaza seems to have taken no part in the rebellion of Ashdod in B.C. 713-711, or in that of Hezekiah of Judah in B.C. 701, and its King Sil

Bel was therefore presented with a part of Hezekiah's territory. Sil Bel is mentioned as a faithful vassal of Asurbanipal (B.C. 668-626); and even in the time of Nabunaid of Babylonia (B.C. 556-539) the vassals of Gaza are mentioned. During the Achæmenian period the city must have been of great importance. Herodotus (ii. 159), who calls it Kadytis, says that it seemed to him not inferior to Sardis. In B.C. 332 it was taken by Alexander only after a siege of two months, the Persian General Bates, with the aid of Arabian mercenaries, offering a stout resistance. Gaza was destroyed in B.C. 96 by Alexander Jannæus, the Nabatean King Aretas failing to send aid. The ruined city is referred to in Acts viii. 26, and also in a Greek geographer as ἐρημος, *erêmos*, 'desert.' The port grew up into a new Gaza. Under the Roman administration Gaza was rebuilt, and attained to a significance that it had scarcely possessed before. Hellenic culture made it a rival of Antioch, Alexandria, and Athens. In its temples Greek gods were worshipped; Greek art flourished among its wealthy citizens; from its schools went forth famous rhetoricians, philosophers, and poets. Representatives of Neo-Platonism, such as Proclus, Olympianus, and Isidor, taught in Gaza in the fifth and sixth centuries, the last of them even after the closing of the school of Athens in 529. Christianity also found here philosophically educated defenders, such as Procopius, Choricus, and Johannes. But both the native faith, the worship of the god Marna, 'our lord,' and the Greek cults continued in Gaza longer than in any other great Syrian city. Omar captured the city in 634. The Crusaders found it in ruins. In 1149 Baldwin II. built a citadel which he left to the Templars to defend. Saladin plundered the city in 1170, but could not take the citadel until 1187. Napoleon took it in 1799. Consult: Clermont-Ganneau, *Archæological Researches in Palestine* (London, 1896); Stark, *Gaza und die philistäische Küste* (Jena, 1852); Smith, *Historical Geography of the Holy Land* (London, 1895); and Gatt, in *Zeitschrift des deutschen Palästina-Vereins*, vol. i. (1888).

GAZA, THEODORUS (c.1398-c.1475). A famous teacher of the Greek language and literature in the West, the successor of Emmanuel Chrysoloras. He was born in Thessalonica, and came to Italy between the years 1435 and 1440, apparently from Constantinople. The Latin language he learned under Vittorino da Feltre at Mantua, and studied so assiduously that in three years he was a master of the tongue: soon after 1441 he was appointed professor of Greek in the newly established school at Ferrara. About 1450 Pope Nicholas V. invited him, along with other learned Greeks, to Rome, where he was appointed to the chair of philosophy. At this time he made a Latin translation of Aristotle's *Problemata* in mechanics and of his *History of Animals*. Later he made translations of many other Greek works. After the death of Pope Nicholas, King Alfonso gave him an invitation to remove to Naples in 1455; but the death of this monarch in 1458 necessitated his return to Rome, where he found a patron in Cardinal Bessarion, who obtained for him a small benefice in Southern Italy. But the learned Greek longed for Rome, to which he returned for a time under the Popes Paul II. and Sixtus IV. He died in Calabria about 1475.

Gaza has been warmly praised by subsequent scholars, such as Politian, Erasmus, Scaliger, and Melancthon. His principal writings are his *Introductio Grammatica Libri IV.* (a work on the elements of Greek grammar, first published by Aldus Manutius, at Venice, A.D. 1495, and long held in high repute), a number of epistles to different persons on various literary subjects, and a variety of important translations into Latin, besides those already mentioned, portions of Aristotle, Ælian, Theophrastus, Saint Chrysostom, Hippocrates, and other Greek writers. Consult: Hodus, *De Græcis Illustribus* (London, 1742); also Voigt, *Wiederbelebung des klassischen Altertums*, vol. ii. (Berlin, 1893).

GAZALAND, gâ'zà-lând. A portion of Portuguese East Africa (q.v.).

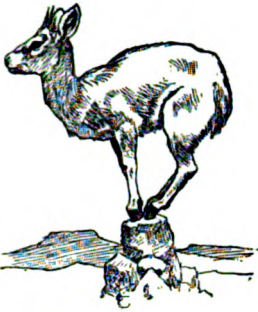
GAZE (ME. *gasen*, from dialectic Swed. *gasa*, to stare). A term in heraldry (q.v.), descriptive of a hart or stag represented *affrontée*, or looking full-faced from the field. Such an animal is said to be at gaze.

GAZELLE, gâ-zèl' (OF. *gazel*, gazelle, Sp. *gazela*, from Ar. *ghazal*, gazelle, from *ghazila*, to be affectionate). A name applied to various small, slender, and graceful antelopes, with large, liquid eyes and short horns. About twenty species are known in Southwestern Asia and Northern Africa. They are distinguished from each other by the length of the ringed and usually lyrate horns, and by color; but the differences are often hard to define, and some zoölogists regard as mere varieties what others hold to be perfectly distinct species. The best known species is the true gazelle (*Gazella dorcas*), which exhibits the typical characters of the group in their highest perfection. It is of a light tawny color, the under parts white; a broad brown band along each flank; the hair short and smooth. The face is reddish fawn-color, with white stripes at each side, inclosing a dark triangular space. The horns of the old males are nine or ten inches long, bending outward and then inward, like the sides of a lyre, also backward at the base and forward at the tips; then tapering to a point and showing thirteen or fourteen permanent rings. The horns of the female are smaller. The ears are long, narrow, and pointed; the eyes very large, soft, and black; there is a tuft of hair on each 'knee;' the tail is short, with black hairs on its upper surface only and at its tip. This gazelle is a native of the north of Africa, Asia Minor, Syria, and Arabia. It was known to the ancients, and is described by Ælian under the name *dorcas*, which was also given to the roe-deer. The speed of the gazelle is such that it cannot be successfully hunted by any kind of dog, but in some parts of the East it is taken by the assistance of falcons, and is also captured in inclosures made near its drinking-places. Although naturally very wild and timid, it is easily domesticated, and when taken young becomes extremely familiar. Tame gazelles are very common in Asiatic countries, and Oriental poetry abounds in allusions to their beauty and gentleness.

Various other species of gazelles should be mentioned. The commonest species of the Sahara is Loder's (*Gazella Loderi*), called 'reem' by the Arabs of Algeria, which lives on berries and leaves, and is said never to drink.

Another species of the eastern Sahara high-

GAZELLES AND SMALL ANTELOPES



1. KLIPSPRINGER (*Oreotragus saltator*).
2. NAKONG (*Tragelaphus spekei*).
3. COMMON or DORCASS GAZELLE (*Gazella dorcas*).
4. SPRINGBOK (*Gazella eucochore*).

5. GUIB (*Tragelaphus scriptus*).
6. ISABELLINE ANTELOPE (*Gazella isabellina*).
7. CHOUSINGA (*Tetracerus quadricornis*).
8. BLACKBUCK (*Antelope cervicapra*).

lands is the admi or mountain gazelle (*Gazella Cuvieri*), which often comes down at night in small bands to feed upon the grain in the valleys. It is twice the weight of the dorcas, and in quickness and facility in eluding observation it is almost equal to the aoudad. The common gazelle of Arabia is *Gazella Arabica*. Abyssinia and the open country southward have several species, among them the beautiful Kordofan species (*Gazella isabellina*), isabelline in color, with a reddish instead of the usual black tail; Grant's (*Gazella Granti*), very numerous about Kilimanjaro, and having the longest horns of the genus; the long-necked greenuk (*Lithocranius Walleri*); the diminutive Thomson's gazelle, and others. In South Africa the springbok (*Gazella euchores*) is widespread and familiar. (See SPRINGBOK.) West Central Africa has several local species, of which the swift gazelle (*Gazella mohr*) and the korin are perhaps best known; and the dig-dig and dama (q.v.) are familiar in the Sudan.

Of the Asiatic gazelles the Indian chinkara (*Gazella Bennetti*), known to Anglo-Indian sportsmen as the 'ravine deer,' is the most familiar. It inhabits the plains from Central India to Persia, keeps to the broken country, and is so exceedingly swift as to furnish excellent sport with greyhounds or falcons, and is also much hunted with the cheeta (q.v.). It is light chestnut in general color above, and has long, ringed horns; the buck stands about twenty-six inches high at the shoulders. Two other species inhabit the lofty plains of Mongolia and Thibet, and a third, the Persian gazelle (*Gazella gutturosa*), is well known from the Caspian Sea to the desert of Gobi. Blanford's writings on the zoölogy of India and Persia contain extensive accounts of these and other Asiatic forms. See ANTELOPE, and the names of various species; and Plate of GAZELLES.

GAZETTE (It. *gazetta*, gazette, small coin; probably a diminutive of Lat. *gaza*, Gk. γάφα, treasure). A newspaper. In 1566 the Venetian Government established an official news-sheet, which was not printed at first, but only written out and exhibited in public places. The fee for reading it was a small coin called *gazetta*. The name was soon applied to the sheet itself. The *London Gazette*, founded in 1665, is the official organ of the Government. It appears twice a week. It is recognized in law as the medium of official and legal documents. Similar gazettes are published in Edinburgh and in Dublin. The word *gazette* is now common as a part of the title of many newspapers. See NEWSPAPERS.

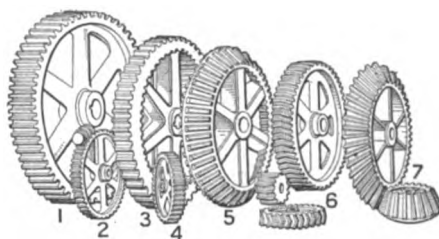
GAZETTEER. A geographical dictionary, more or less descriptive and statistical. The word is connected with *Gazetier*, gazetteer, a writer in newspapers; and one of the early publications of this character (that of Laurence Echard) was entitled: "The Gazetteer's or Newsman's Interpreter, being a Geographical Index of all Considerable Cities, Patriarchships, Ports, etc., in Europe." The oldest known geographical dictionary is the sixth-century fragment of Stephanus Byzantius. Some of the best known of modern gazetteers in the English language are Blackie's *Imperial* (Glasgow, 1850); Alexander Keith Johnston's (1850, new ed. 1877); Lippincott's *Pronouncing Gazetteer of the World* (Philadelphia, 1855; new ed. 1880; supplement, 1900);

Longman's *Gazetteer of the World* (London, 1895). A monumental encyclopædia of universal geography is Vivien de Saint-Martin's *Nouveau dictionnaire de géographie* (Paris, 1877-1900). A very exhaustive gazetteer (as far as the number of entries is concerned) is the so-called Ritter's *Geographisch-statistisches Lexikon* (Leipzig, 1874; new ed. 1894). On a smaller scale is the *Dizionario geografico universale* of G. Garollo (Milan, 1898), a work remarkable for its accuracy. As a type of special gazetteer on a magnificent scale, may be mentioned Hunter's *Imperial Gazetteer of India* (London, 1881; new edition 1886-88). There are special gazetteers of the individual States of the American Union.

GAZ/OGENE. See AERATED WATERS.

GEARING (from *gear*, AS. *gearice*, from *gearu*, ready, Eng. *yare*). A term applied to the parts of machinery by which motion in one part of a machine is communicated to another; gearing consists in general of toothed wheels, friction-wheels, endless bands, screws, etc., or of a combination of these. When the communication between the two parts of the machine is interrupted the machine is said to be *out of gear*; and when the communication is restored it is said to be *in gear*. Gearing has also for its object the increasing or diminishing of the original velocity, and in reference to this is distinguished by the term 'multiplying' or 'retarding.' See GEAR-WHEEL.

GEAR-WHEEL. A toothed wheel used to transmit motion and power from one part of a machine to another. Gear-wheels are of great variety of forms, the most common being spur wheels, in which the teeth are parallel to the



TYPICAL GEAR-WHEELS.

1. Spur gear. 2. Worm wheel and gear. 3. Internal gear. 4. Spur gear. 5. Bevel gear. 6. V-shaped gear. 7. Bevel gear.

axis of the wheel; bevel wheels, in which the teeth are cut radially in the face of a cone; worm wheels, in which the teeth are cut spirally. A familiar example of spur gearing is found in the works of a watch, and the ordinary chainless bicycle affords a simple example of bevel gears. The various forms of gear-wheels and their theoretical design will be found described in treatises on machine design, which should be consulted for technical details of this nature. Consult: Kent, *Mechanical Engineer's Pocket Book* (New York, 1900); and Reuleaux, *The Constructor* (Philadelphia, 1893).

GEARY, gā'ri or gē'ri, JOHN WHITE (1819-73). An American soldier and politician. He was born of Scotch-Irish parentage in Westmoreland County, Pa., was educated at Jefferson College, but left before graduating, and entered upon a commercial career at Pittsburg, at the same time studying both civil engineering and law.

He then engaged for some time in civil engineering in Kentucky, and on the outbreak of the Mexican War was chief engineer and superintendent of the Allegheny Portage Railway. This position he resigned, and helped recruit the Second Pennsylvania Volunteer Regiment, in which he became lieutenant-colonel, and served throughout the war. After the capture of the City of Mexico he was promoted to the rank of colonel, and was placed in command of the city. After peace was declared he settled in San Francisco, where, in 1849, he was appointed the first American postmaster, and was given authority to organize post-offices and mail routes on the coast. In the same year he became the first American *alcalde* of San Francisco, and in 1850, upon the adoption of an American system of municipal government for the city, was chosen its first Mayor. He was active in the movement that resulted in giving California a new constitution, was a prominent member of the convention which drew it up, and took a leading part in securing the admission of California into the Union as a free State. After serving a year as the head of the Democratic State Committee he returned to Pennsylvania, where he remained in retirement until 1856, when he was appointed by President Pierce Territorial Governor of Kansas, succeeding Shannon, whose vacillation had aroused the hostility of both the Free-State and Pro-Slavery factions. Geary's rule in Kansas was impartial and firm, and in a few months he restored order, and was able to report to Washington a most satisfactory condition of affairs. Had the Pierce Administration supported him satisfactorily, or had the incoming Buchanan Administration shown any intention of doing so, there might have been an end of bloodshed in Kansas. But the predominance of pro-slavery men in the councils of both Pierce and Buchanan appeared to Geary to render all that he had accomplished of only temporary effect, and, disgusted with the conduct of affairs, he resigned soon after Buchanan's inauguration. At the beginning of the Civil War Geary raised the Twenty-eighth Pennsylvania Volunteer Infantry, of which he became colonel, served with distinction in the Army of the Potomac, and was promoted brigadier-general in April, 1862. He was wounded at the battle of Cedar Mountain in the following August, and commanded the Second Division of the Twelfth Army Corps at Chancellorsville and Gettysburg. Transferred to the Army of the Cumberland, he distinguished himself at the battles of Wauhatchie and Lookout Mountain, and later commanded a division on Sherman's march to the sea, serving as military governor of Savannah after its capture. In 1865 he received the brevet rank of major-general. He was elected Governor of Pennsylvania as a Republican in 1866, and was reelected in 1869, serving until within eighteen days of his death.

GEBA, zhā'ba. A short river in Portuguese Guinea, West Africa, flowing in a southwestern direction through the colony, and entering the Atlantic by a wide estuary. At its mouth is situated the small town of Geba.

GEBAL, gē'bal. See BYBLOS.

GEBANG (gē-bāng') **PALM** (native name), *Corypha Gebang*. A fan-leaved palm, native of the East Indies, where it is one of the most useful plants. The trunks of this palm become sixty

to eighty feet high and two feet in diameter, with leaves eight to ten feet in diameter. Its stem yields a kind of sago; its root is medicinal, being both emollient and slightly astringent, so as to be particularly adapted to many cases of diarrhœa; its leaves are used for thatch, for making broad-brimmed hats, and for various other economic purposes; its young leaves are plaited into baskets and bags, in the manufacture of which many of the people of Java find employment; the fibres of its leafstalks are made into mats, ropes, baskets, nets, cloth, etc. To the genus *Corypha* belongs also the talipot palm (q.v.).

GEBAUER, gā'bou-ēr, JAN (1838—). A Czech philologist, born at Ubislavice, Bohemia, and educated at the University of Prague, where he was appointed instructor in literature, and was elected to the professorship of Slavic philology in 1881. He published a number of translations from the Russian, Bulgarian, and Sanskrit, but is best known for his studies and researches into the ancient Czech language and literature, in which his most important publications are: the *Nova rada* of Smil Flaška (1876), and *Žaltář Wittenberský* (1880). He also wrote Czechic grammars (1890 and 1896) and an Old-Czechic dictionary. From 1874 he was associate editor of the *Listy Filologické*.

GEBER, gā'bēr. The name assigned to the author of a vast number of Arabic works on alchemy, astrology, and magic, as well as some of genuine scientific value. Who Geber was is uncertain, and some Arabic scholars have even denied his existence. His full name may have been Abu Musa (or Abdallah) Jabir ibn Hajjan es-Sufi, and it is said he lived in the eighth or ninth century. He appears to have resided for some time at Cufa, and according to some Cufa was his birthplace; others say Damascus, and still others favor Harran in Mesopotamia or Tarsus in Cilicia. About twenty-six works attributed to Geber are known by title, the manuscripts of many being in the libraries of Leyden, Paris, and elsewhere. There are Latin translations of some of them, *Geberi Philosophi de Alchimia Libri Tres* (1531), and *Geberi Arabis Chimia sive Traditio Summæ Perfectionis et Investigatio Magisterii* (1668). An English translation of the latter, and of other treatises, by Russell, appeared in 1678. So great was Geber's fame that for many centuries his experiments were repeated by European chemists. Roger Bacon called him *Magister Magistrorum*. Consult Berthelot, *La chimie au moyen âge*, vol. iii. (Paris, 1893); Wüstenfeld, *Geschichte der arabischen Aerzte* (Göttingen, 1840).

GEBHARDT, gep'härt. EDUARD VON (1838—). A distinguished German historical painter, born at Saint Johannes, Esthonia. After studying at the Academy of Saint Petersburg (1855-58) and at the School of Art in Karlsruhe for the next two years, part of which he spent in traveling, he became in 1860 the pupil of Wilhelm Sohn at Düsseldorf, where he permanently settled, was appointed professor at the academy in 1873, and became one of the most conspicuous ornaments of that institution. His works mark a new departure in the pictorial treatment of religious subjects in Germany, upon which, in keeping with the modern realistic tendency, he endeavored to impress a national stamp after the manner of the

Flemish and German masters of the fifteenth and sixteenth centuries, endowing his figures with the costume and features typical of that period. The more important among the many biblical scenes he painted are: "Entry of Christ into Jerusalem" (1863); "Christ on the Cross" (1866, Reval Cathedral); "The Last Supper" (1870, National Gallery, Berlin), one of his finest creations, masterly in characterization of the life-sized figures; "Crucifixion" (1873, Hamburg Gallery), with a strong leaning toward the Old-Flemish School; "Ascension of Christ" (1881, National Gallery, Berlin), another masterpiece, life size, of more ideal conception; "Taking Care of Christ's Body" (1883) and "Jacob and the Angel" (1893), both in Dresden Gallery; "Christ and the Rich Youth" (1892) and "Sermon on the Mount" (1893), both in Düsseldorf Gallery; "Healing of the Palsied" (1895, Breslau Museum). Of several episodes from the period of the Reformation may be mentioned "The Reformer at Work" (1877, Leipzig Museum). To some pre-Raphaelite impressions received on a visit to Italy in 1882, a cycle of six mural paintings, "Scenes from the Life of Christ" (completed 1891), in the Cistercian Monastery at Lokkum, bear witness. He also painted many excellent portraits, and was awarded the great gold medal at the Berlin Exhibition of 1886. Consult the monographs by Rosenberg (Leipzig, 1899) and Schaarschmidt (Munich, 1899).

GEBHARDT, gēph'ärt, OSKAR LEOPOLD VON (1844—). A German Protestant theologian, born at Wesenberg in Esthonia, and educated at Dorpat, Tübingen, Erlangen, Göttingen, and Leipzig. In 1893 he was appointed chief librarian and professor of paleography in the University of Leipzig. He published *Græcus Vencus* (1875); Theile's *Novum Testamentum Græce* (11th to 16th ed. 1875-1900); *Das Neue Testament griechisch und deutsch* (4th ed. 1896); Tischendorf's *Novum Testamentum Græce* (6th ed. 1894; and an editio minor, 2d ed. 1891); *The Miniatures of the Ashburnham Pentateuch* (1883).

GEBHART, zhā'bār', EMILE (1839—). A French writer, born at Nancy. He was educated at the Lycée of Nancy and the Ecole Française d'Athènes; from 1860 was professor of foreign literatures at Nancy, and from 1879 of Romance literatures in the faculty of philosophy at Paris. His works include: *De l'Italie* (1876), and *Les origines de la Renaissance en Italie* (1879), both crowned by the Académie Française. In 1896 he was elected to the Académie des Sciences Morales et Politiques.

GEBIRS, gā'bérz. See GHEBERS.

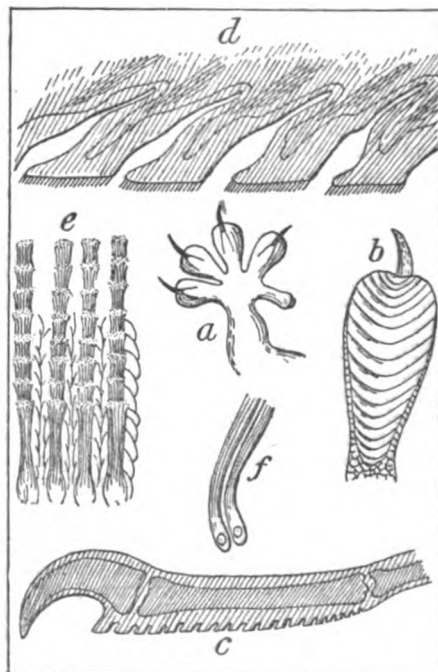
GEBLER, gā'blér, OTTO (1838—). A German painter, born in Dresden. He was a pupil at the academy there, and afterwards studied in Munich under Piloty. He is entirely an animal painter, and there is often an element of humor in his careful works, the best of which are: "Obstinate Sheep;" "Disturbed Domestic Peace" (1863); "Art Critics in the Stable" (1873), National Gallery, Berlin; "Sheep and Spaniel" (1878); "Two Poachers" (1880); and "Reynard's End" (1883), New Pinakothek, Munich.

GEBLER, TOBIAS PHILIPP, Baron (1726-86). An Austrian statesman and dramatist. He was born at Zeulenroda, Saxony, and was educated at Jena, Halle, and Göttingen. After travels abroad he was (in 1748) appointed secretary of

legation of the Netherlands at Berlin. Five years later he entered the Austrian service, in which he found rapid promotion, rising to the rank of Vice-Chancellor of the Court in 1782. He was a liberal statesman, and rendered efficient service to the cause of education. He also tried to reform the stage, and himself wrote some plays, now forgotten. His *Theatralische Werke* were published in three volumes in 1772-73. His drama *Der Minister* was very popular in its day (1771).

GEBWEILER, gā'vi-lér (OHG. *Gebunclare*). A town in Upper Alsace, Germany, situated at the mouth of the Blumenthal, about 17 miles south-southwest of Colmar (Map: Germany, B 4). It has a splendid twelfth-century church in the Transition style, and a fourteenth-century Dominican church, now used as a market and concert hall. Gebweiler is one of the industrial centres of Alsace. Among its products are machinery, cotton and woolen goods, wooden articles, soap, and brick, and especially white wines of a superior grade. Gebweiler is mentioned as early as 774. Population, in 1890, 12,367; in 1900, 13,259, mostly Roman Catholics.

GECKO. A lizard of the family Geckonidæ, which naturalists have divided into many genera. The geckos are of small size, and generally of repulsive aspect; the colors of most of them are dull, and the small granular scales with which they are covered are in general mingled with tubercles. The legs are short, the gait usually



STRUCTURE OF A GECKO'S FOOT.

a, the whole foot, from above; b, under side of a toe, with its clinging ridges; c, diagram of a section through a toe, showing the ridges in section; d, a few ridges, in section, magnified, showing their bristles; e, f, bristle-cells, much enlarged. (After Semper.)

slow, measured, and stealthy, although geckos can also run very nimbly when danger presses,

and often disappear suddenly when they seem almost to be struck or caught. The feet are remarkable, being adapted for adhering to smooth surfaces, so that geckos not only readily climb trees or walls, but creep inverted on ceilings, or hang on the lower side of large leaves. The body and tail are never crested, but are sometimes furnished with lateral membranes, variously festooned or fringed, and sometimes so large as to be of use to arboreal species in enabling them to take long leaps from branch to branch. Such is the case with the flying or fringed gecko (*Ptychozoon homalocephalum*) of the Malaysian region. The geckos feed chiefly on insects. They are quarrelsome, and will sometimes devour their eggs or young, and even their own tails and exuviated skins. They are natives of warm climates, and are very widely distributed over the world, and are more or less nocturnal in their habits. Two species are found in the south of Europe, both of which frequently enter houses, as do the geckos of Egypt, India, Ceylon (the 'chucha'), and other warm countries. Only one gecko (*Sphaerodactylus notatus*) dwells in the United States, although three or four kinds are found in southern California and Mexico. It is scarcely two inches in length, and is sparingly found in Florida and Cuba.

The name 'gecko' is derived from a peculiar cry often uttered by some of the species, which in some of them resembles syllables distinctly pronounced, while others are described as enlivening the night in tropical forests by a harsh cackle, such as that which gives the 'croaking lizard' (*Thecodactylus lævis*), so abundant in Jamaica, its lugubrious name. The geckos have, in almost all parts of the world where they are found, a bad reputation as venomous, and as imparting injurious qualities to food which they touch; but there is no good evidence in support of any such opinion. They lay a few eggs in some warm hollow of a stump, or similar place, and pay little attention to them or to the young. In cool countries they hibernate. Consult: Gadow, *Amphibia and Reptiles* (London, 1901); Gosse, *A Naturalist's Sojourn in Jamaica* (London, 1851). See the article LIZARD.

GED, WILLIAM (1690-1749). The inventor of the art of stereotyping. He was born in Edinburgh, where he was employed for some years as a goldsmith and jeweler. In 1725 he took out a patent for making stereotyped plates from pages of type. He met with active opposition from both compositors and type-founders. He was ruined financially by a man named Fenner, with whom he entered into partnership in London. He procured, in 1731, a contract for printing Bibles and prayer-books by his process from Cambridge University, but had turned out only two prayer-books when his failure compelled his return to Edinburgh and the surrender of the contract. In Edinburgh he printed, in 1744, an edition of *Sallust* from stereotyped plates, but he was never able to carry his ideas out successfully, and died in poverty.

GEDDES, géd'dès, ALEXANDER (1737-1802). A biblical critic, translator, and miscellaneous writer. He was born in Scotland in 1737, of Roman Catholic parents, and educated for a priest in his native country and in Paris, where

he acquired an excellent knowledge of languages. In 1764 he returned to Scotland, and for fifteen years held various positions as priest, and became distinguished by his charities, his liberality of sentiment, and decided literary ability. In 1779, in consequence of difficulties with his bishop, he left his church, and the next year was dismissed on charges of having attended Protestant worship and gone hunting. He went to London, and devoted himself to literature, although he still occasionally officiated as priest till 1782. With the support of Lord Petre he was able to carry out a work long planned, viz. a translation of the Bible into English for the use of Roman Catholics. After various preliminary publications to pave the way, the first volume appeared in 1792 under the title, *The Holy Bible, or the Books Accounted Sacred by Jews and Christians, otherwise called the Books of the Old and New Covenants, faithfully translated from the Corrected Text of the Original, with Various Readings, Explanatory Notes and Critical Remarks*. In 1797 the second volume was published, carrying the translation as far as the end of the historical books; and in 1800 a third volume was issued, containing his *Critical Remarks on the Hebrew Scriptures*. The opinions enunciated in these volumes, especially in the last, were, for their time, startlingly heretical, and approximated to some of the results of modern criticism. The tone is decidedly rationalistic, and the author had little tact in presenting his views. As a result, Protestants and Roman Catholics united in their condemnation, although the translation was in the main excellent, and many of the remarks of value. In 1792 his translation was interdicted by the Roman Catholic authorities in London. Geddes died in London, February 26, 1802, and mass was prohibited over his remains. For his life, consult Good (London, 1803).

GEDDES, ANDREW (1783-1844). A Scotch painter, born in Edinburgh. He was a pupil of the Royal Academy, and traveled much abroad. In 1810 he exhibited his "Draught Players"; after that he gave himself almost entirely to portrait painting for several years. He also became an excellent etcher of portraits. His other works include: "Discovery of the Scottish Regalia" (1821); "Christ and the Woman of Samaria" (1832); "Devotion"; and "Dull Reading." His portraits are truthful, well drawn, and full of life.

GEDDES, JAMES (1763-1838). An American engineer. He was born near Carlisle, Pa., but removed, in 1794, to Onondaga County, N. Y., where he engaged in the salt business. He was one of the earliest and most active advocates of the Erie Canal, and made the first surveys of the route in 1808. After serving in the State Legislature, and as a county judge, he was a Representative in Congress from 1813 to 1815. In 1816 he became supervising engineer of the Erie Canal, and in the following year chief engineer in the construction of the Champlain Canal. His success in these undertakings gave him the reputation of being the foremost canal engineer in the country, and his services were much in demand. In 1827 he surveyed and laid out the line of the Chesapeake and Ohio Canal, and in 1828 was made chief engineer of the State canals in Pennsylvania.

GEDDES, JAMES LORRAINE (1827-87). An American soldier, born in Edinburgh, Scotland, who came to Canada with his family at the age of ten. In 1843 he revisited Scotland, whence he subsequently went to India. After a course at the British Military Academy, Calcutta, he entered the army, and won distinction in the Punjab campaign, after which he returned to Canada. In 1857 he emigrated to Vinton, Iowa. He fought in the Civil War from 1861 to 1865, distinguished himself at Shiloh, Vicksburg, Corinth, and Mobile, and in 1865 was brevetted brigadier-general of volunteers. During the latter years of his life he was prominently associated with the Iowa College of Agriculture. As an author he is widely known through his celebrated war-songs, such as "The Soldier's Battle Prayer," and "The Stars and Stripes."

GEDDES, JENNY. Popularly supposed to have been the name of a woman who inaugurated a riot in Saint Giles's Church, Edinburgh, on Sunday, July 23, 1837. When the Dean of Edinburgh began to read from a service-book prepared by Archbishop Laud, and highly obnoxious to the Scotch Presbyterians, some old woman in the congregation cried out indignantly, and threw her stool at the Dean's head. A great tumult ensued, which proved the death-blow of the liturgy in Scotland. Who the woman really was is uncertain. It has been claimed that she was the wife of one John Mein, and others say her name was Hamilton. Consult *Proceedings of the Society of Antiquaries of Scotland*, vol. iii. (Edinburgh, 1852).

GEDDES, PATRICK (1854—). A Scotch botanist, biologist, and educator, born in Perth. He was educated at University College (London), the Sorbonne, and the universities of Edinburgh and Montpellier, and was appointed demonstrator of practical physiology at University College, of natural history at Aberdeen, and of botany at Edinburgh, as well as lecturer on natural history at the Edinburgh School of Medicine. Perhaps his most important work was that in connection with his University Hall project at Edinburgh, a student colony similar in design to Mansfield College at Oxford. He showed great interest in municipal art and education, and also became director of a printing establishment interested chiefly in the publication of works of Celtic literature. His publications include *The Evolution of Sex* (with J. Arthur Thompson) and *Chapters in Modern Botany*. In an article entitled "The World's First Sociological Laboratory" (*American Journal of Sociology*, 1899), Prof. Charles Zeublin, of the University of Chicago, gives a very instructive account of Professor Geddes's educational experiments in Edinburgh.

GEDIKE, gä'di-ke, FRIEDRICH (1754-1803). A German educator, born at Boberow, Brandenburg. He studied theology at Frankfort-on-the-Oder, and was successively director of the Werdersche Gymnasium (1779-91) and of the Köllnische Gymnasium, Berlin (1793-1803), which institutions greatly improved under his administration. He was one of the foremost educators of his day, and greatly promoted the advancement of education throughout Prussia. His works include: *Schulschriften* (1789-95); *Vermischte Schriften* (1801); and *Geschichte des Friedrich-*

Werderschen Gymnasiums, a centenary publication (1781).

GEDIMIN, gä-dé'min, or GEDYMIN, Grand Prince of Lithuania, about 1315-40. He fought against the Teutonic Knights and the Russians, and conquered a large portion of Russia, including Kiev. He was killed in an assault upon a castle of the Teutonic Knights. The city of Vilna was founded by him in 1320.

GEDON, gä'don, LORENZ (1843-83). A German architect and sculptor, born in Munich, where he studied sculpture and applied art, and in 1872 made his mark with the erection of the Palais Schack. Equally at home in the German Renaissance, the baroque, and rococo styles, he applied his greatest decorative talent to the architectural arrangement and decoration of the buildings for the various industrial exhibitions in Munich in 1876, 1879, 1882, and 1883, but especially to the adornment of the German art room at the Paris Exposition of 1878, which led to a complete reform in decorating picture galleries. His principal structure is the Heylshof in baroque style at Worms, besides which he executed much admirable work of a decorative nature in the gorgeous castles of King Ludwig II., in the town hall, and in private palaces in Munich.

GEEFS, gäfs. A family of Belgian sculptors. **GUILLAUME GEEFS** (1806-83) was a sculptor of the classical school of Canova. He was born at Antwerp, September 10, 1806, the son of a baker. He studied at the academy in Antwerp, and in 1828 won the grand medal and a stipend, which enabled him to study in the atelier of the elder Ramey in Paris. Returning to Belgium about 1830, he made the monument of General Beilliard, and in 1833 the tomb of the Count Frédéric de Mérode, now in the Cathedral of Brussels—the most striking of his works. He designed also the monument to the victims of the Revolution of 1830, in the Place des Martyrs in Brussels. He made the Rubens monument in Liège. In the Paris Exposition of 1855 Geefs exhibited a colossal marble statue of King Leopold I. of Belgium, and his statue of the "Amorous Lion." He made numerous other monuments, statues, and busts. Geefs was Chevalier of the Légion d'Honneur in France, and held many Belgian orders. He died January 24, 1883. His wife, **FANNY ISABELLE MARIE, née Corr** (1814-83), was successful as a painter, especially in genre subjects.

JOSEPHS GEEFS (1808-85). The brother of Guillaume. He was born in Antwerp, was educated there and in Paris and Rome, and was appointed professor in the academy at Antwerp in 1841. He made the equestrian statue of King Leopold I. in Antwerp in 1868, the statue of Van Hogendorp in Rotterdam, 1860, the sculpture of the front of the Flemish theatre in Antwerp, 1872. **ALOYS GEEFS** (1817-41), a younger brother, was also a sculptor, but of less importance. Consult: *Bartholeyns, Guillaume Geefs, sa vie et ses œuvres* (Brussels); Génard, *Anvers à travers les âges* (ib., n.d.); Hymans, *Bruxelles à travers les âges* (ib., n.d.).

GEEL, gäl, JAKOB (1789-1862). A distinguished Dutch scholar, born at Amsterdam, and educated at the Athenæum of that city, principally under Van Lennep. After living at The Hague from the year 1811 as a family tutor, he became second librarian at Leyden in 1823, and

in 1833 head librarian and honorary professor. He had made himself meanwhile known as a classical philologist by editions of Theocritus, with the *Scholia* (1820); of the *Anecdota Hemsterhusiana* (1826); of the *Scholia in Suetonium* of Ruhnken (1828); of the *Excerpta Vaticana* of Polybius (1829); and his *Historia Critica Sophistarum Græcorum* (1823) had called forth several treatises on the same subject from German philologists. In 1840 appeared his edition of the *Olympicus* of Dio Chrysostom, accompanied by a *Commentarius de Reliquis Dionis Orationibus*; and in 1846 he issued the *Phænissæ* of Euripides, with a commentary, in opposition to Hermann. All these works, which are written in pure and pleasing Latin, are models of thorough scholarship, as well as of taste and method. Geel contributed further to the revival of classical learning in the Netherlands by the establishment, along with Bake, Peerlkamp, and Hamaker, of the *Bibliotheca Critica Nova*, in 1825. The national literature is also indebted to him not only for the translation of German and English works into Dutch, but also for original treatises on various æsthetical subjects. He won, moreover, the gratitude of the learned throughout Europe by his liberality as a librarian, and especially by his *Catalogus Codicum Manuscriptorum, qui inde ab Anno 1741 Bibliothecæ Lugduni Batavorum Accesserunt* (1852).

GEELBEC, gäl'bék (Dutch, yellow-beak). The Dutch local name in Cape Colony, South Africa, for the commonest wild duck (*Anas flavirostris*).

GEELONG, gē-lông'. A city of Victoria, Australia, picturesquely situated on the south side of Corio Bay, 45 miles southwest of Melbourne by rail (Map: Australia, G 6). The discovery of gold-fields in the neighborhood in 1851 added to the prosperity of the city, which had become noted for its wool trade. The first woolen mill in Victoria was erected here. Alongside of the railway jetty, which is 1000 feet long, large ships can load and discharge their freight. There are various industries, especially manufactures of woolen cloth, paper, and rope. Other industries are tanning, meat-preserving, and fishing. There are a produce exchange, a mechanics' institute, botanical gardens, public park, a college, and a public library. The district is exceedingly fertile. Limestone and a kind of marble are found in the neighborhood. Population, in 1891, 11,700; in 1901, 12,400.

GEELVINK (gäl'vink) **BAY**. An inlet of the Pacific Ocean, on the northern coast of Dutch New Guinea (Map: East Indies, J 5). It penetrates 300 miles inland, and receives a number of rivers.

GEER AF FINSPÅNG, yār äv fin'spång, LOUIS GERHARD, Baron de (1818-96). A Swedish statesman and author, born at Finspång. He was Minister of Justice from 1858 to 1870, and was reappointed to that office in 1875. In the following year he was also appointed president of the Ministry, which position he retained until 1880, when he became chancellor of the universities of Sweden. He introduced numerous legislative reforms bearing on religion, the penal code, maritime and military laws, and copyright, and, above all, the organization of the chief legislative departments of the Government, and the introduction of the two chambers with popular representation (1866). Besides several short stories,

essays on æsthetics, and biographical works, he published his memoirs, *Minnen* (1892).

GEERTZ, garts, JULIUS (1837-1902). A German genre and portrait painter, born in Hamburg, where he first studied under the brothers Gensler. At the School of Arts in Karlsruhe, from 1856 to 1860, he was a pupil of Descoudres, then in Düsseldorf of Jordan. In 1864 he went to Paris to study the old masters, and after visiting Brittany and Holland settled at Düsseldorf, where his genre scenes, serious and humorous, especially those from child life, met with great favor. Besides "The Criminal after the Sentence" (1873), which made his reputation, there may be mentioned "Sour and Sweet" (Royal Château of Babelsberg); "Invested" and "Capitulated," two merry juvenile scenes; "Prisoners of War;" "Fight between Poacher and Forester" (1883); and "The Village Hero" (1884). In 1890-91 he was in New York, and painted portraits of Carl Schurz (Liederkrantz Hall), Oswald Ottendorfer, and other prominent German-Americans.

GEESTEMÜNDE, gē'ste-mun'de. A seaport in the Prussian Province of Hanover, Germany, at the mouth of the Geeste, directly opposite Bremerhaven, of which it is a shipping rival, 32 miles northwest of Bremen (Map: Prussia, C 2). The town dates from 1846, when the construction of the harbor was begun. The main basin, opened in 1863, is 1846 feet long, 386 feet wide, and 23 feet deep. The petroleum basin (1875) has a length of 772 feet and a breadth of 145 feet. To the northwest of the main basin is the deep-sea fisheries basin (opened 1896), 3960 feet long, 364 feet wide, and 14½ feet deep. There are large dry docks and several extensive shipyards. The harbor, which is one of the largest artificial waterways in Germany, is never frozen. Geestemünde is heavily fortified. Its trade is very considerable in petroleum, rice, coal, woolens, cereals, fish, sails, wire ropes, etc. Among its many educational institutions is a school of navigation. Population, in 1890, 15,500; in 1900, 20,100.

GEEZ, gēz (Ethiopic ግዕዝ). The ancient native name of the Semitic inhabitants of Abyssinia, the classical Ethiopia, and of their language, now a dead tongue. The word means literally 'wandering,' and designates the people as 'wanderers,' 'nomads,' and their language as the speech of 'freemen.' See ETHIOPIA; SEMITES; SEMITIC LANGUAGES.

GEFFCKEN, gēf'ken, FRIEDRICH HEINRICH (1830-96). A German jurist, born at Hamburg, and educated at Bonn, Göttingen, and Berlin. He was secretary of the legation at Paris in 1854; represented Hamburg at Berlin in 1856, and in 1859 he was Minister of the Hanse cities at Berlin, and later (1866) at London. In 1888 he was arrested at the instance of Prince Bismarck to answer to the charge of treason, as he had published without authority in the *Deutsche Rundschau* quotations from the journal of Frederick III. After an inquiry of three months, Geffcken was set free. His works, published anonymously, include: *Die Reform der preussischen Verfassung* (1870); *Der Staatsstreich von 1851 und seine Rückwirkung auf Europa* (1870); *Die Verfassung des deutschen Bundesstaats* (2d ed. 1870); and *L'impasse orientale* (1870); and, signed, *Die Alabamafrage* (1872); *Das Deutsche Reich und die Bankfrage*

(2d ed. 1874); *Staat und Kirche* (1875; in English by Taylor, 1877); *Zur Geschichte des orientalischen Krieges, 1853-56* (1881); *Politische Federzeichnungen* (2d ed. 1888); and *Frankreich, Russland und der Dreibund* (1893).

GEFFRARD, zhá'frár', FABRE (1806-79). President of Haiti. He was the son of Nicholas Geffrard, one of the founders of Haitian independence, and was born at Anse Veau, Haiti. In 1821 he entered the army as a private soldier, attaining the grade of captain in 1843, in which year he joined Hérad in rebellion against Boyer, whom he defeated near Jacmel. Having been appointed general of division in 1845, he was deprived of his command by President Riche, who was jealous of his popularity, and tried by a court-martial. After the death of Riche (1847), he regained his influence. From 1849 to 1856 he was actively engaged in the army, and distinguished himself in the campaign of 1856 against Santo Domingo, particularly in the retreat from San Juan. Finding that it was the intention of the Emperor Faustin (Soulouque) to arrest him, he proclaimed himself president in December, 1858, and drove Soulouque from Port-au-Prince, January 15, 1859. In spite of the insurrections he had to repress, Geffrard gave Haiti the most moderate government it had as yet enjoyed. Commerce and industry prospered with the reduction of taxes, and schools were founded in many parts of the country. Nevertheless, the revolutionary spirit continued active, and Salnave, who had twice attempted a rising and failed, was finally successful in February, 1867, when Port-au-Prince went over to him, and Geffrard was compelled to flee to Jamaica, where he died.

GEFFROY, zhe-frwá', EDMOND AIMÉ FLORENTIN (1806—). A French actor and painter. He was born at Maignelay (Oise), and studied at the College of Angers. With little preliminary training, he made his successful first appearance in the rôle of Orestes in *Andromaque* at the Théâtre Français (1829), and from that time until his resignation in 1865 was regarded as one of the principal actors at that theatre. He played at the Odéon from 1872 to 1878. He also achieved considerable fame as a painter, and was a pupil of Amaury-Duval. Many of his principal works were exhibited in the Salon, such as "Charles VII. and Agnes Sorel" (1839); "La Sainte Vierge et l'enfant Jésus" (1841); "Les sociétaires de la Comédie Française" (1842); and another of the same title (1863-64), which contains portraits of Mmes. Augustine Brohan, Arnould-Plessy, Bonval, Judith, Favart, and many other distinguished actors and actresses of that celebrated theatre.

GEFFROY, MATHIEU AUGUSTE (1820-95). A French historian, born in Paris. He graduated at the Ecole Normale in that city in 1840. After holding professorships at the lycéums Clermont-Ferrand, Louis le Grand, and elsewhere, he was successively appointed professor at Bordeaux and at Paris, and subsequently conducted the French School at Rome, becoming director of that institution in 1875. His historical works cover a wide field, and embrace: *Histoire des états Scandinaves* (1851); *Des origines et de la formation de l'Europe moderne* (1853); *Marie Antoinette: Correspondance secrète* (with Arneth, 1874); *Mme. de Maintenon d'après sa correspondance authentique* (1887).

GEFLE, yév'le. The capital and chief commercial town of the Swedish Län of Gefleborg, situated at the mouth of the river Gefle, about 71 miles north of Upsala (Map: Sweden, G 6). The town has been in great part rebuilt since the fire of 1869. The principal buildings are the castle, the fine town hall, the library, and the high school. The town is increasing in industrial importance, producing chiefly linen, sailcloth, cotton goods, and tobacco. There is also some ship-building and iron-molding. A large export trade is carried on in the iron and lumber of the surrounding districts; imports are mainly grain, cotton, spices, textiles, and fertilizers. Population, in 1900, 29,522.

GEGENBAUR, gá'gen-bour, JOSEPH ANTON VON (1800-76). A German historical painter, born at Wangen, Württemberg. His first efforts without instruction were so promising that Robert von Langer admitted him at the age of fifteen to his class in drawing at the Munich Academy. In 1820 he brought to Stuttgart the portraits of his parents and a "Saint Sebastian," which so favorably impressed the sculptor Dannecker that he recommended the young artist to King William. By a royal stipend Gegenbauer was enabled to study three years longer in Munich, and then, until 1826, in Italy, where, besides sketching diligently from nature, he devoted himself particularly to the works of Raphael, and developed high qualities as a colorist. To his appreciation of Raphael his "Expulsion from Paradise" and "Moses Striking the Rock," both in the Royal Palace at Stuttgart, bear witness. His first attempt in fresco-painting, "Hercules and Omphale," made in 1826 on one of the walls of his studio, was bought by Thorwaldsen for his museum at Copenhagen. A copy in oil on a smaller scale is in the Stuttgart Gallery. On his return to Stuttgart he was intrusted with the execution of frescoes in the Royal Villa Rosenstein, near Cannstatt, depicting the story of "Cupid and Psyche" according to Apuleius, and "The Four Seasons." After a second sojourn in Italy, from 1829 to 1835, he was appointed Court painter at Stuttgart, and for nearly twenty years was employed in decorating a number of rooms in the new royal palace with episodes from the mediæval history of Württemberg. Besides these important works, his principal creations, he painted many excellent portraits and easel pictures of religious and mythological subjects, in Stuttgart and in Rome, where in his latter years he regularly passed the winter, and where he died. In all his creations he proved himself a draughtsman of superior skill, with a perfect command of the human form, and his frescoes are to be commended for great power of invention, clearness of composition, spirited animation in the figures, and an unusually rich and vigorous coloring.

GEGENBAUR, KARL (1826-1903). A German comparative anatomist. He was born in Würzburg, Germany, and studied medicine in Würzburg, where he was a pupil of Kölliker and of Virchow; received the degree of M.D., and was afterwards privat-docent from 1853 to 1855. In the latter year he became professor of anatomy and director of the Anatomical Institute in Jena, and remained there until 1873, when he became professor of anatomy at Heidelberg. He spent two years in Sicily studying invertebrate life,

making important researches on pteropods and heteropod mollusks. He also worked on the histology of Limulus. He is not only the leading comparative anatomist in Germany, but one of the first class, ranking with Huxley and Owen, and is distinguished by the great range of his learning, which covers the entire field of animal morphology, as well as by the boldness of his speculations. He was the first comparative anatomist to place the study of anatomy on an evolutionary basis, and thus became the founder of modern anatomy. His most important works are: *Grundzüge der vergleichenden Anatomie* (1870); *Grundriss der vergleichenden Anatomie* (1878), translated into English by F. J. Bell, under the title *Elements of Comparative Anatomy* (1878); *Lehrbuch der Anatomie des Menschen* (1883; 3d ed. 1886); *Vergleichende Anatomie der Wirbelthiere mit Berücksichtigung der Wirbellosen* (1898). Since 1876 he has edited the *Morphologisches Jahrbuch*, which he founded. In his *Comparative Anatomy of Vertebrates* (1898) Gegenbaur shows how conditions prevailing among invertebrates can be made to throw light upon the more complicated vertebrate forms. Gadow characterizes this great work as "a mine of most suggestive ideas." In this, as in all his works, he strives to derive any given organ from some earlier, more ancestral or generalized structure, instead of being satisfied with its conditions or its present degree of specialization. Gegenbaur's most fruitful work was his theory of the origin of limbs and their girdles from the embryonic visceral arches. His views on the derivation and evolution of free limbs were also the outcome of a masterly research.

GEHENNA (Gk. *Γέεννα*, or *Γέεννα*, *Geenna*). A term used in the New Testament as a designation of the place of punishment of the wicked after death. The word is a transliteration of the Aramaic *Gehennam* or *Gehinnam*, which is an equivalent of the Hebrew *Ge Hinnom*. (For origin of name, see HINNOM, VALLEY OF.) In the New Testament it never refers to the valley south of Jerusalem. It occurs twelve times. Outside of the Synoptic Gospels it is found only in James iii. 6, where the tongue is said to be set on fire by Gehenna. In Luke it is used only once—viz. xii. 5, where God is said to have the power of casting into Gehenna after He has killed. In the corresponding passage in Matthew (x. 28) the disciples are warned to fear Him who is able to destroy both soul and body in Gehenna. The only passage in Mark that has the word is ix. 43-47, where it occurs three times, the sacrifice of a head, a foot, or an eye being recommended in preference to Gehenna (cf. Matt. v. 29, 30; xviii. 8, 9). In addition to the parallels to the passages quoted from Mark and Luke, Matthew records three sayings of Jesus, in which He declares that the man who says *more*, i.e. 'thou fool,' is liable to the Gehenna of fire (v. 22); that the Pharisees make their proselyte twice as much a son of Gehenna as they are themselves (xxiii. 15); and that the Pharisees are a brood of vipers not likely to escape the judgment of Gehenna (xxiii. 33). Whether Jesus actually used the language ascribed to Him upon these occasions, and, if so, what meaning He attached to the term, are questions that have been seriously discussed without any definite agreement having been reached. It will be noted that all of

these statements are found only in Matthew; that xxiii. 23-33 seems to be a duplicate of the words of John the Baptist; and that Luke (xvii. 1, 2) records the saying as to offenses that must come, without the amplifications of Matthew and Mark. It is also manifest that in some instances the word is used in a figurative sense. The counsel to sacrifice hand, foot, or eye can certainly not be taken literally, and there is no valid reason for supposing that Gehenna is, in the same connection, to be understood more literally. Manifestly Jesus cannot have intended to draw such a distinction between an angry disposition and a contemptuous epithet like *raka*, 'empty head,' on the one hand, and a similar epithet, *more*, 'fool,' on the other hand, as to affix temporal penalties for the former and eternal punishment for the second. As He cannot have desired the local courts to take cognizance of the feelings of a man's heart, or the supreme court to make a capital case of a hasty word, but must have used *beth din* and *Sanhedrin* figuratively, so He is likely to have employed Gehenna in a similar way. 'Son of Hell' as a characterization of a hypocrite and formalist is also to be understood as a figure of speech. But in Matt. x. 28 (Luke xii. 5) Gehenna is evidently meant to be taken more literally, of man's fate after death. The most natural interpretation of this passage is that the destruction of both body and soul in Gehenna means complete cessation of being. But the evangelical tradition scarcely permits any definite conclusions on this point. See HADES; HELL.

GEIB, gip, KARL GUSTAV (1808-64). A German criminologist, born at Lambsheim, Bavaria. He studied at Heidelberg, Munich, and Bonn, and was strongly influenced by the eminent professors Mittler and Mittermayer. In 1832 he was sent to Greece as secretary to the members of the regency appointed during the minority of King Otho, and upon his return was appointed to the chair of law at the University of Zurich. In 1842 he was appointed professor of criminal and civil procedure at that institution, whence he was called in the same capacity to Tübingen. In his investigations Geib was a strict adherent of the historical method. The work entitled *Geschichte des römischen Kriminalprozesses bis zum Tode Justinians* (1842), although superseded by more recent investigations, had an extraordinary influence upon the development of the science of jurisprudence in Germany. It is characterized by thoroughness and profound research.

GEIBEL, gi'bel, EMANUEL (1815-84). A popular German poet. He was born at Lübeck, October 17, 1815; was graduated at Bonn (1836); lived for two years in Berlin in literary society; went as tutor to Athens (1838); traveled extensively with Ernst Curtius in the Grecian Archipelago, and returned to Lübeck in 1840. He led a studious life there and on the Rhine, at Stuttgart, Hanover, and Berlin; received a pension from the King of Prussia in 1843, and in 1852 was made professor of æsthetics at Munich. He returned to Lübeck in 1868, and resided there till his death, on April 6, 1884. His fame rests chiefly on his lyric poetry: *Gedichte* (1840); *Juniuslieder* (1848); *Neue Gedichte* (1856); *Gedichte und Gedenklblätter* (1864); *Spätherbälblätter* (1877); and the posthumous *Gedichte aus dem Nachlass* (1896). He wrote also two trage-

dies—*Brunhild* (1858) and *Sophonisbe* (1868)—and a comedy, *Meister Andrea* (1865). He collaborated with others in several volumes of noteworthy translations—namely, *Klassische Studien*, with Ernst Curtius (1840); *Volkslieder und Romanzen der Spanier* (1843); *Spanisches Liederbuch*, with Paul Heyse (1852); *Romanzero der Spanier und Portugiesen*, with Schack (1860); *Fünf Bücher französischer Lyrik*, with Leuthold (1862). Selected translations from Greek and Latin poets appeared as *Klassisches Liederbuch* (1875). Geibel's Works are in eight volumes (3d ed. 1893); his correspondence is contained in part in *Briefe an Karl Freiherrn von Malsburg* (1885). For his biography, consult: Goedeke (Stuttgart, 1869); Litzmann (1887); Leimbach (Wolfenbüttel, 1894); and Gaedertz (Leipzig, 1897).

GEIERSTEIN, g'ēr-stin, ANNE OF. The heroine of Scott's novel of the same name; a noble German-Swiss heiress, supposed to possess supernatural powers, and hence called 'The Maiden of the Mist,' which appellation furnishes the subtitle of the story. She finally marries a son of the exiled Earl of Oxford.

GEIGER, g'g'er, ABRAHAM (1810-74). A distinguished rabbi and Jewish scholar. He was born at Frankfort-on-the-Main, and was educated at Heidelberg and Bonn. At Bonn he gained a prize for an essay on the Jewish sources of the Koran, published (1833) under the title *Was hat Mohammed aus dem Judentum aufgenommen?* (reprint of Eng. trans., Madras, 1898), which is still of considerable value. In 1832 he became rabbi in Wiesbaden, and in 1835 one of the editors of the *Zeitschrift für jüdische Theologie*. In 1838 he was chosen associate rabbi at Breslau; in 1863 he removed to Frankfort, where he was rabbi until 1870, and was then elected to the charge of the largest Jewish congregation in Germany—namely, at Berlin—and remained there till his death, in 1874. In 1862 he founded the *Jüdische Zeitschrift für Wissenschaft und Leben*. Geiger's work was mainly in theological lines, and he was one of the foremost advocates of the 'reform' of Judaism, standing for liberality in the construction and observance of the Jewish traditional law. In line with this work he published a new Hebrew ritual, and became professor in the 'Hochschule für die Wissenschaft des Judenthums,' a school to train Jewish rabbis according to the modern interpretation of Judaism, which he had helped to found. Endowed with an unusually active mind, he worked untiringly, and of his extremely numerous works on Jewish history, literature, and theology, only a few can be mentioned here: *Lehr- und Lesebuch zur Sprache der Mischna* (1845); *Beiträge zur jüdischen Literaturgeschichte* (1847); *Discan des Castellers Abu'l-Hassan Juda ha-Levi* (1851); the two very important works, *Urschrift und Uebersetzungen der Bibel in ihrer Abhängigkeit von der innern Entwicklung des Judentums* (1857) and *Sadduzäer und Pharisäer* (1863); a collection of lectures published under the title *Das Judentum und seine Geschichte* (1864-71); and *Salomo Gabirol und seine Dichtungen* (1868). His posthumous works, *Nachgelassene Schriften*, were published by his son Ludwig; the last volume of this collection contains his biography and letters. The most important of his works

is the *Urschrift*, an exceedingly valuable contribution to the history of Old Testament literature.

GEIGER, LAZARUS (1829-70). A German philologist, born at Frankfort-on-the-Main. He studied at Bonn, Heidelberg, and Würzburg. During the last nine years of his life he was instructor in German, Hebrew, and mathematical geography at the Jewish High School of Frankfort. His principal philological works are respectively entitled: *Ursprung und Entwicklung der menschlichen Sprache und Vernunft* (2d ed. 1899), and *Der Ursprung der Sprache*.

GEIGER, LUDWIG (1848—). A German writer, author of numerous works on the history of civilization and of literature, born at Breslau. After study at Heidelberg, Göttingen, and Bonn, he became lecturer in history at Berlin in 1873, and in 1880 was appointed to a chair of modern literature there. His more important researches have been concerned with the history of humanism, to which he contributed such valuable studies as *Nikolaus Ellenbog, ein Humanist und Theolog des sechzehnten Jahrhunderts* (1870); *Johann Keuchlin, sein Leben und seine Werke* (1871); *Petrarca* (1874), an examination of Petrarch's significance as author and scholar, in which biographical detail is subordinated; and *Renaissance und Humanismus in Italien und Deutschland* (1882). He also thoroughly revised Jakob Burckhardt's *Die Kultur der Renaissance in Italien* (7th ed., 2 vols., Leipzig, 1899). In 1880 he began the publication of the *Goethe-Jahrbuch*, and from 1886 to 1892 was proprietor and an editor of the *Zeitschrift für Geschichte der Juden in Deutschland* (5 vols.), in connection with which subject he published the antedated volumes *Das Studium der hebräischen Sprache in Deutschland vom Ende des fünfzehnten bis zur Mitte des sechzehnten Jahrhunderts* (1870), and *Geschichte der Juden in Berlin* (1871). Others of his works include *Vorträge und Versuche* (1890), and *Berlin 1688-1840* (2 vols., 1893-95).

GEIGER, g'g'er, NIKOLAUS (1849-97). A German sculptor and painter, born at Lauingen, Bavaria. He was a pupil of Knabl at the Munich Academy. In 1873 he went to Berlin, and soon became known through ornamental work in a private palace. After a visit to Italy he studied painting in Munich, and in 1884 returned to Berlin, where he was awarded a gold medal in 1886, was elected member of the Academy in 1893, and was made professor in 1896. His most important works in Berlin are the groups of "Inspiration" and "Homage of Art" (1886), in the Exhibition Building; the high relief, "Adoration of the Magi" (1894), in Saint Hedwig's Church; and "Centaur and Nymph," in the National Gallery. A frieze in relief for the Soldiers' Monument at Indianapolis may also be mentioned, and of his paintings "The Communion of the Saints," on the ceiling of Saint Hedwig's, Berlin, is the most noteworthy.

GEIGER, WILHELM (1856—). A German Orientalist. He was born at Nuremberg, the son of an evangelical clergyman, and was educated especially at the University of Erlangen, under the Iranian scholar Spiegel, whom he succeeded in 1891 as professor of Sanskrit and Indo-Germanic philology. Among his publications on Indo-Iranian subjects are: *Aogemadaëd ein Parsentractat* (1879); *Handbuch der Awesta-*

sprache (1879); *Ostiränische Kultur* (1882), translated into English as *The Eastern Iranians* (London, 1885); *Elementarbuch der Sanskrit-Sprache* (1888); *Ceylon* (1898); *Litteratur und Sprache der Singhalesen* (1901); and, as co-editor and contributor, *Grundriss der iranischen Philologie* (1885—).

GEIJER, yî'er, ERIK GUSTAF (1783-1847). A Swedish historian, poet, and composer, born at Ransäter, Wermland, January 12, 1783. He was educated at the Gymnasium of Karlstad and at the University of Upsala, and in 1803 competed successfully for an historical prize offered by the Academy of Sciences at Stockholm. In 1806 he obtained his master's degree from Upsala, and in 1809 traveled in England. The year following he became a lecturer in history at Upsala, and in 1815 assistant to Fant. In 1817, on the death of his chief, Geijer was made professor in his place. Geijer was hardly less famous as a poet than as an historian, and he exercised a marked influence on the poetic literature of Sweden. According to the testimony of his countrymen, his *Sista Skalden*, *Vikingen*, *Odal-bonden*, and other heroic pieces place him in the foremost rank of Swedish poets. He and his friends Adlerbeth, Tegner, and Nikander adhered to the 'Gothic' School of poetry, which owed its origin to the Society of the Goths, established as early as 1810; they published at the same time a magazine, *Iduna* (1811-24), in which first appeared several of Geijer's best poems. Great as is the value of Geijer's historical works, he did not complete any one of the vast undertakings which he planned. Of the *Svea Rikes häfder* (or Records of Sweden), which were to have embraced the history of his native country from mythical ages to his own times, he finished only the introductory volume. His *Svenska folkets historia* (3 vols., 1832-36), which was intended to form one of the series of European histories edited by Leo and Ukert, was not carried beyond the abdication of Queen Christina (1654), the reason probably being the author's conversion to liberalism in history and politics; yet, incomplete as they are, these works rank among the most valuable contributions to Swedish history. To Geijer was intrusted the task of examining and editing the papers which Gustavus III. (q.v.) had bequeathed to the University of Upsala, with the stipulation that they were not to be opened for fifty years after his death. In fulfillment of his charge, Geijer arranged these papers in a work which appeared in 1843-45 under the title of *Gustaf III:s efterlemnade papper*; but they contained little or nothing of value. During the last ten years of his life Geijer took an active part in politics; but although his political writings possess great merit, the very versatility of his powers diverted him from applying them methodically to the complete elaboration of any one subject. In addition to being an historian, poet, and publicist, Geijer was well known as a musician and composer of no mean order. He set many of his own songs to stirring music, and poems of his rendering appear in the Swedish Service Book. In 1814-15 he cooperated with Afzelius in producing a three-volume edition of Swedish folk-songs of the Middle Ages. In 1846 increasing ill health forced him to resign his position as professor at Upsala. He died April 23, 1847, at Stock-

holm. He left some personal memoirs of value, *Minnen* (Upsala, 1834). His collected works, *Samlade Skrifter*, with a bibliographic treatise by Teodblad (8 vols.), appeared at Stockholm (1873-75). His *History of the Succedes* down to Charles X. was translated into English by Turner, with biographical introduction (London, 1845). For brief biographical treatises, consult: Malmstroem (Upsala, 1848); Fries (Stockholm, 1849); and Carlson (Stockholm, 1870).

GEIKIE, gē'ki, Sir ARCHIBALD (1835—). A distinguished British geologist, born in Edinburgh, where he attended the high school and university. Becoming a member of the Geological Survey of Scotland under Murchison, he was raised in 1867 to the office of director. From 1871 to 1882 he held the Murchison professorship of geology and mineralogy in the University of Edinburgh, resigning the position to become general director of the Geological Survey of the United Kingdom and director of the Museum of Practical Geology in London. Geikie is an eminent authority and contributor on geological subjects. His studies in inorganic geology, particularly physiography, dynamism, and the structure of the earth, show a keen appreciation of natural processes, while his geological text-books are models for arrangement, general balance, and facility of expression. He is a member of many scientific societies in Great Britain and other countries, including the Royal Society of London and the Institute of France, and has received the honorary degrees of D.C.L. from Oxford, D.Sc. from Cambridge, and LL.D. from Edinburgh. In 1891 he was elected president of the Geological Society of London, an honor that was accompanied the same year by the title of knight. He has also served as president of the British Association for the Advancement of Science. In 1897 Geikie visited the United States to deliver the first series of lectures on the George Huntington Williams foundation at Johns Hopkins University. Among his more important works, some of which have passed through several editions, are the following: *Scenery of Scotland, Viewed in Connection with Its Physical Geography* (1869); *Field Geology* (1879); *Text-book of Geology* (1882); *Class-book of Geology* (1886); *Ancient Volcanoes of Britain* (1897); *The Founders of Geology* (1897); and *Types of Scenery and Their Influence on Literature* (1898).

GEIKIE, JAMES (1839—). A Scottish geologist and author, brother of Sir Archibald Geikie, born at Edinburgh. He was educated at Edinburgh University, was appointed an assistant in the British Geological Survey in 1861, and in 1869 was made director of the Survey in Scotland. In 1882 he was elected to succeed his brother as Murchison professor of geology and mineralogy at Edinburgh University, where he subsequently was made dean of the Faculty of Science. His works include: *The Great Ice Age* (1874); *Prehistoric Europe* (1882); *Outlines of Geology* (1884); *Songs and Lyrics of Heinrich Heine and Other German Poets* (1887); *Fragments of Earth-Lore* (1892); and *Earth Sculpture; or, The Origin of Surface Features* (1898).

GEIKIE, JOHN CUNNINGHAM (1824—). An English clergyman and writer. He was born in Edinburgh. He studied at Queen's College, To-

ronto, Canada; held Presbyterian pastorates at Halifax, N. S., and at Toronto, and later in England. In 1876 he took priest's orders in the English Establishment, and was successively settled in Dulwich (1876), Paris (1879), Barnstaple (1883), and Norwich (1885). He retired to Bournemouth in 1889. His wide fame rests upon his *Life of Christ* (1876); his history of the *English Reformation* (1878); *Hours with the Bible* (1880); *The Holy Land and the Bible* (1887).

GEILER VON KAYSERSBERG, gî'lër fôn ki'zërz-bërk, JOHANN (1445-1510). A famous German preacher, born at Schaffhausen, but brought up by his grandfather at Kaysersberg (Alsace), whence his epithet. He was educated at Ammersweier and at Freiburg, and soon after his taking orders went to Basel, where he became dean of the philosophic faculty (1474) and a professor of theology (1475). A year later he returned to Freiburg, and became rector of the university. In 1478 he became preacher at the Cathedral of Strassburg, and held this office for thirty-two years. Of his sermons, the best known are the cycle called *Navicula sive Speculum Fatuorum* (1510). In the same satiric form and showing the same power and religious depth are *Das Schiff der Pönitz* (1514), *Der Seelen Paradies* (1510), and *Christliche Pilgerschaft* (1512), all first composed in Latin and delivered in German. His more important works may be found in Lorenzi, *Geilers ausgewählte Schriften* (1881-83), and an excellent biography and general criticism in Gödeke, *Grundriss zur Geschichte der deutschen Dichtung*, vol. i., p. 397 sqq. (1884). Consult: Lindemann, *Johann Geiler von Kaysersberg, ein katholischer Reformator am Ende des fünfzehnten Jahrhunderts* (1877); and Schmidt, *Histoire littéraire de l'Alsace à la fin du XVème siècle* (1879).

GEILFUS, gîl'fûs, GEORG (1815-91). A Swiss historian, born at Lampertheim, Germany. He studied at Giessen, and in 1856 was appointed rector of all the schools of Winterthur, a position which he retained for twelve years. Besides numerous minor writings, historical and biographical, he published the important work entitled *Helvetia. Vaterländische Sage und Geschichte* (4th ed. 1879).

GEINITZ, gî'nîts, HANS BRUNO (1841-1900). A German geologist and paleontologist. He was born at Altenburg, and was educated at Berlin and Jena. He was appointed professor of mineralogy and geognosy at the Polytechnic Institute of Dresden in 1850, and director of the Museum of Mineralogy there in 1857. His works include: *Charakteristik der Schichten und Petrofakten des sächsisch-böhmischen Kreidegebirges* (1843); *Die Versteinerungen der Steinkohlenformation in Sachsen* (1855); *Geologie der Steinkohlen Deutschlands und anderer Länder Europas* (1865); *Carbonformation und Dyas in Nebraska* (1866); *Geologie von Sumatra* (1875); *Ueber fossile Pflanzen und Tierarten in den argentinischen Provinzen San Juan und Mendoza* (1876).

GEISHA, gâ'e-shâ (Chino-Japanese, person of pleasing accomplishments). One of a class of young women in Japan endowed with more than the ordinary share of personal attractions, elegant and accomplished in the arts of gayety, and especially in music and the peculiar rhythmic dances of the country, who form the chief feature

at entertainments in the average social life of Japan. It is customary to speak of geishas as 'singing girls.' They correspond, in some degree, to the Almech of Egypt and other parts of the Orient. Usually the training of the girl begins when she is seven years old. The geisha is the imposing theme of a large number of rhapsodical and erotic writers on Japan, but in the new and better social life of Japan and reconstruction in national habits and ideals, the solution of the geisha problem is a serious one.

A capitation tax of one yen per month is levied on each geisha. Consult: Bacon, *Japanese Girls and Women* (Boston, 1891); and Chamberlain, *Things Japanese* (London, 1891).

GEISHÜSLER, gîs'hüs-lër, OSWALD. See MYCONIUS, OSWALD.

GEISSEL, gîs'sel, JOHANNES VON (1796-1864). A German Roman Catholic prelate. He was born at Gimmeldingen in the Palatinate, and was educated at the Episcopal Seminary in Mainz. In 1819 he was appointed professor at the Gymnasium of Speyer, and three years later became a member of the chapter. He was made dean in 1836 and bishop in 1837. In 1842 he became the coadjutor, and three years later the successor, of the Archbishop of Cologne. After the Revolution of 1848 he was chosen a member of the Prussian Constituent Assembly, and it was largely due to his influence that the independence and rights of the Church in Prussia were assured by the new Constitution. In 1850 his services were recognized by promotion to the cardinalate. He was a zealous defender of the Ultramontane position in Germany, and distinctly favored the Jesuits. One of his most noteworthy achievements was the suppression of Hermesianism. (See HERMES, GEORG.) The long-delayed completion of the Cologne Cathedral was undertaken about the time of his appointment as coadjutor, and he was able in 1863 to celebrate its successful termination, with the exception of the towers. His writings, edited by Dumont (1869-76), include addresses, novels, poems, and miscellaneous writings. A work of great magnitude is that entitled *Der Kaiserdom zu Speyer* (2d ed. 1876). Consult also Remling, *Cardinal von Geissel* (Speier, 1873).

GEISSLER, gîs'lër, HEINRICH (1814-79). A German scientific instrument maker, born at Igelshieb, Saxe-Meiningen. After acquiring considerable proficiency as a glass-blower, he established at Bonn, in 1854, his well-known factory for making chemical and other scientific apparatus. He was noted for his inventive genius, and also for the excellence of the scientific instruments of his manufacture. The celebrated mercurial air-pump used for obtaining high vacua, and known as the 'Geissler pump' (see AIR-PUMP), was first constructed by him, as were also the well-known Geissler's tubes (q.v.).

GEISSLER'S TUBES. The general name for sealed vessels arranged to show the brilliant effects of electricity passed through rarefied gases. They usually consist of glass tubes and bulbs with platinum wires inserted to form the electrical connections. These tubes are filled with various rarefied gases, and show an infinite variety of delicate lights in figures or patterns, depending upon the shape of the tubes, the arrangement of the wire connections inside, the gas, and the degree of rarefaction. The effects pro-

duced, besides being very curious, are of value to the investigator, as they afford a means of examining various incandescent gases with the spectroscope, and numerous other experiments.

GEIST, gíst (Ger., 'spirit'). Used oftenest in the compound term *Zeitgeist*, or 'spirit of the age,' 'time-spirit,' introduced into English literary language by Matthew Arnold.

GEITNER, gít'nër, ERNST AUGUST (1783-1852). A German chemist, born at Gera. After conducting a chemical factory at Lössnitz, he founded another at Schneeberg, in 1815, which he conducted until his death. He was eminent as a chemical investigator, and was the discoverer of the alloy *argentan*, or German silver. He also devoted considerable attention to the chemistry of dyeing, and was the first to utilize chromic salts for animal and vegetable dyes. He published: *Briefe über die Chemie; Die Familie West, oder Unterhaltungen über Chemie und Technologie*; and several important writings on the scientific preparation of grape-sugar and grape-syrup from potato-flour.

GEITONOGAMY, gít'ò-nòg'á-mí (from Gk. γείτων, *geitôn*, neighbor + γάμος, *gamos*, marriage). Cross-pollination between flowers on the same plant; contrasted with xenogamy (q.v.). See POLLINATION.

GELA (Lat., from Gk. Γέλα). In ancient times, an important town on the southern coast of Sicily, on the river of the same name. It was founded by a Rhodian and Cretan colony, B.C. 690. Its rapid prosperity may be inferred from the circumstance that as early as the year B.C. 582 Agrigentum was founded by a colony from Gela. After Cleander had made himself tyrant in the year B.C. 505, the colony reached its highest pitch of power under his brother Hippocrates, who subdued much of East Sicily. Gelon, the successor of Hippocrates, pursued the same career of conquest, and Syracuse itself fell into his hands, and was even made his principal residence, Gela being committed to the government of his brother Hiero. Here Æschylus, after having been honorably received by Hiero, died and was buried about B.C. 456. During the Carthaginian wars it suffered greatly, but its ruin was completed by Phintias, of Agrigentum, who before B.C. 280 removed the inhabitants to a town in the neighborhood which he had founded and named after himself. Its site is believed to be occupied by Terranova, at the mouth of the Fiume di Terranova.

GELADA (jél'á-dá) **BABOON**. See BABOON.

GELASIUS. The name of two popes. (1) **GELASIUS I.** (Pope 492-96). He restated the supremacy of Rome over Constantinople, and insisted on the removal of the name of Acacius, Bishop of Constantinople, from the official list of holy persons for whom prayers were to be offered. During his pontificate the canonical books of the Old Testament were determined by a council at Rome. He vigorously opposed the Manichæan, Pelagian, and Arian heresies, and defended the purity of Christian life against immoral heathen practices. After his death he was canonized, his day being November 18th. His works are in Migne, *Patrol. Lat.*, lix. Consult his life by Roux (Paris, 1880); the *Gelasian Sacramentary*, edited by Wilson (Oxford, 1894).

(2) **GELASIUS II.** (Pope 1118-19). He was born of noble descent at Gaeta, about 1050. He received his theological education in the Abbey of Monte Cassino, and afterwards held the office of cardinal-deacon, under Urban II., and of chancellor under Paschal II. On the death of Paschal II. he was elected Pope by the cardinals. Cencius Frangipani, a partisan of the Emperor Henry V., laid violent hands upon him and threw him into prison, but he was set at liberty through the general uprising of the people in his behalf. The sudden appearance of the Emperor, however, compelled him to leave Rome for Gaeta, and the Imperial party chose an antipope, Burdinus, Archbishop of Braga, Portugal, under the name of Gregory VIII. Gelasius held a council at Capua, and excommunicated his rival and the Emperor. Returning to Rome, under the protection of the Norman princes, he lay concealed for a while, narrowly escaping capture once more by the Frangipani, and, after wandering through Italy and France, died at Cluny in 1119. His letters are in Migne, *Patrol. Lat.*, clxiii.

GELATIN (from Neo-Lat. *gelatina*, from Lat. *gelatus*, p.p. of *gelare*, to freeze, from *gelu*, frost), or **GLUTIN** (not *gluten*). A hard, yellowish, transparent, elastic substance obtained from connective animal tissues, especially the organic constituents of bones. If bones are treated with cold dilute acids, their mineral matter is dissolved out, the residual organic matter, called *ossein*, retaining the shape of the bones and gradually swelling up to a transparent elastic mass. If this ossein is cautiously treated with hot dilute acids, or simply for a long time with boiling water, it is hydrolyzed and converted into gelatin. In using acids, caution is necessary in order to prevent their attacking the gelatin produced by them from ossein. The ordinary commercial process for preparing gelatin consists in carefully washing the connective tissue employed (intestines, bladders, etc.), then cutting it and digesting in a dilute solution of soda lye for ten days at a moderate heat. The material is then removed into an air-tight chamber lined with cement, where it is heated at a temperature of 70° F. It is next transferred to revolving cylinders supplied with an abundance of clean cold water for washing, and afterwards is placed in another chamber, lined with wood, where it is bleached and purified by exposure to the fumes of burning sulphur, after which it is washed with cold water to remove traces of sulphurous acid. The next operation is to squeeze it as dry as possible and transfer it to the gelatinizing pots, which are large earthen vessels inclosed in steam-tight wooden cases. Into these vessels water is poured, and the mass is kept at a high temperature by means of steam coils surrounding the pots. By this process the gelatin is dissolved out of the tissue and is strained off while still hot. It is then poured out in thin layers, which, as soon as they are sufficiently cool and consolidated, are cut into small oblong plates and laid on nets to dry. If the solution is dark-colored it may be purified by treatment with animal or vegetable charcoal. The gelatin of bones may be extracted on a large scale by the combined action of steam and a current of water trickling over their crushed fragments in a properly constructed apparatus. When the gelatin is to be used as an article of food, the bones must be quite fresh,

well preserved in brine, or dried by a stove, and should be crushed by passing between grooved iron rollers. The purification of commercial gelatin may be effected by soaking in distilled water for some days in order to remove salts, dissolving in hot distilled water, and filtering while hot into 90 per cent. alcohol. The gelatin then separates in the form of white thready masses, which can be subsequently dried. The pure gelatin thus obtained contains only about one-half per cent. of ash, and although distinctly different as a chemical substance from the proteids, it resembles the latter in percentage composition.

Gelatin is readily digested and absorbed in the animal body, forming a food-stuff of considerable value, especially in training diets. Physiological research has shown, however, that it is in no case transformed into true proteid matter, and cannot therefore serve as material from which animal tissues are built up.

Gelatin is soluble in concentrated acetic and mineral acids; if thus treated it loses its gelatinizing property, but the solution may be used as a cement for glass and for certain other purposes. In contact with cold water it swells up to an elastic transparent mass, which is mechanically combined with much water; the mass readily dissolves in warm water, but on cooling, the solution 'gelatinizes,' and thus gelatin is extensively used for culinary purposes, being employed as a vehicle for other materials; for instance, in making jellies. Gelatin is further used in taking casts and impressions for electrotyping, and besides being employed for gelatin dry plates in photography, it is used in the carbon processes of photographic printing, which depends on the power of certain bichromates to render the gelatin insoluble when exposed to the action of light. This last property has also led to the use of gelatin as an insoluble glue or waterproofing material. Gelatin is one of the ingredients of printers' rollers; it is also employed in dyeing, and as a size in paper-making and painting. As a fining it is employed in beer-brewing, and it also finds application in medicine as a coating for pills and capsules. The crude gelatin, prepared by the simplest processes, is called *glue*, and has valuable applications as a cement.

Consult: Davidowsky, *Practical Treatise on the Raw Materials and Fabrication of Glue, Gelatin*, etc., translated by Brann (Philadelphia, 1884); Standage, *Cements, Pastes, Glues, and Gums* (London, 1893). See also ISINGLASS; GLUE.

GELATIN PROCESS. Gelatin is used in many photographic and photo-mechanical processes as a vehicle for certain chemicals which either alone or in combination are sensitive to the action of light, and under its influence experience changes in their condition. The substitution of the gelatin film of the dry plate for the collodion surface of the wet plate was an important development in photography, while the fact that gelatin mixed with bichromate of potash becomes insoluble when acted upon by light furnishes the basis for many photographic processes. See PHOTOGRAPHY and PHOTO-ENGRAVING for a description of the more important uses of gelatin in photography and photo-mechanical printing processes.

GELCICH, gəl'kik, EUGEN (1854—). An Austrian scholar and author, born at Cattaro, Dalmatia. He was in the active marine service until 1878, became director of the naval school at Lussinopoccolo in 1881, and of that at Trieste in 1895. His writings include some interesting studies respecting Columbus and the discovery of the American continent, such as the *Kritische Studien zur Columbusgeschichte in the Zeitschrift der Berliner Gesellschaft für Erdkunde*; *La scoperta d'America e Cristoforo Colombo nella letteratura moderna* (1890); and *Die Instrumente und die wissenschaftlichen Hilfsmittel der Nautik zur Zeit der Entdeckung Amerikas* (in Neumeyer's *Festschrift* for the Hamburg-America festival, 1892).

GELDERLAND. An eastern province of the Netherlands, bounded by the Zuyder Zee and the Province of Overijssel on the north, Westphalia and the Rhine Province on the east and southeast, North Brabant on the south, and South Holland and Utrecht on the west. Area, 1965 square miles. The northern part is chiefly sandy and barren. It is only slightly cultivated. The southern portion between the Rhine and the Meuse is low and marshy, but very fertile and productive. The province is watered by the Rhine, Meuse, Berkel, Schipbeek, and a few smaller rivers. The chief occupations are agriculture and stock-raising. Their products are exported, notably cereals, fruits, flax, tobacco, and horses. The manufacturing industries are confined to the production of brick, cotton goods, paper, leather, footwear, and beer. The commerce is facilitated by a canal from Yssel to Zwolle. Population, in 1899, 566,549. Capital, Arnhem (q.v.).

HISTORY. Gelderland was, like other provinces of the Netherlands, a part of the Holy Roman Empire, and first appears in history clearly as the County of Gelre, under Otto of Nassau, who flourished about 1061. In 1339 it became a duchy, but soon thereafter the House of Nassau died out, and, after a long struggle, Gelderland, in 1379, was united to Jülich. Continual wars about the succession to the throne devastated the country, and from 1472 to 1477 Charles the Bold of Burgundy held the duchy, his claims passing to his daughter Mary, wife of Maximilian of Austria. The latter, however, was unable to conquer the country, and only in 1543 was Charles V. able to incorporate the country permanently with the rest of his vast empire. The larger portion, known as Lower Gelderland, shared the history of the rest of the Protestant Netherlands. (See NETHERLANDS.) Upper Gelderland remained with Spain, but was claimed by Frederick I. of Prussia as Duke of Cleves, and taken possession of during the War of the Spanish Succession (1701-13); but he could retain only a portion of it permanently, the rest going to Austria as a part of the Spanish Netherlands. Finally the Austrian portion fell to the independent Netherlands. During the French Revolution Upper Gelderland was united for a time to France. In 1815, by the Peace of Vienna, it was divided between Prussia (where it forms a part of Westphalia) and the Netherlands.

GELDNER, gəl'tnēr, KARL FRIEDRICH (1852—). A German Orientalist. He was born at Saalfeld, Saxe-Meiningen, the son of a clergyman, and studied at the University of Leipzig, and

especially under the famous Sanskritist Roth, in Tübingen. In 1887 he was called to the University of Halle, and thence in 1891 to Berlin as professor extraordinary in the Indo-Iranian languages. His more important publications are: *Ueber die Metrik des jüngeren Avesta* (1877); *Studien zum Avesta* (1882); *Drei Yasht aus dem Zendavesta* (1884); *Vedische Studien*, in collaboration with Pischel (1888, 1892); and a monumental edition of the Zoroastrian Scriptures, *Avesta: the Sacred Books of the Parsis* (Stuttgart, 1885-95).

GÈLE, zhél, ALPHONSO VAN (1849—). A Belgian explorer of Africa, born in Brussels. In 1882 he was sent to Africa, where he became administrator of the region near Stanley Falls. Three years later he revisited the Congo and explored its branches, subsequently tracing the Ubangi to longitude 23° E.

GELÉE, zhe-lá', CLAUDE (1600-82), generally called Claude Lorrain. A French landscape painter and etcher. He was born in the village of Chamagne, in Lorraine, in 1600. His parents were of humble origin, and he was the third son of five children. He became an orphan at twelve, and in consequence sought work for his own support, which led him to Rome about the age of sixteen. His talent and enthusiasm for art were aroused when he saw some landscape paintings of a Flemish painter, Godfrey Wals, then residing at Naples. He made the journey on foot to Naples to discover the master of his choice, and lived in the artist's family for two years, while he made special studies in architectural design and perspective. On his return to Rome he sought employment in the studio of Agostino Tassi, a pupil of Paul Bril, another landscape painter from Flanders. The subjects of Tassi's pictures were picturesque ruins, harbors crowded with fleets and throngs of men from all nations, which were reflected later in the works of Claude. In 1625 he visited Venice and several cities in Germany and France. On his return to Rome, where he lived for the rest of his life, he formed an intimacy with the painter Joachim Sandrart, to whom we owe his biography, and to whom Claude owed the incentive to study directly from nature. He enjoyed the patronage of Pope Urban VIII., for whom he painted two pictures, now in the Louvre, the "Village Fête" and a "Seaport at Sunset." Pope Clement IX. also conferred upon him many favors.

Thirty years of residence in Rome, studying the ancient buildings, made it possible for Claude to give to his pictures a true setting for the semi-pagan tastes of the ruling class. His popularity reached such a point that he found it difficult to supply the demand for pictures, and they brought such high prices that other artists plagiarized his style and name. In order to prevent the sale of fraudulent copies, he designed the *Liber Veritatis*, a book of two hundred sketches in pen and ink wash, which could be used to verify the original work. He worked up to the last year of his life, dying at eighty-two years of age, on November 25, 1682. His character was without reproach; one of his chief traits was thoughtfulness for others. His will gave instructions that his body should be buried in the Church of Santissima Trinità de' Monte. The French Government, in 1836, had the remains removed to the

Church of San Luigi de' Francesi, near the Pantheon.

The subjects of Claude's works are marines and landscapes, often with sylvan groves, and bits of classical architecture. His technique is smooth, but expressed with great simplicity. His color is warm and rich in quality, often glowing with a yellow tone, producing brilliant effects of light reflected in the sky, clouds, and water. One of the charms of his pictures is the unlimited space they present, always interpreted with poetic feeling. As a figure painter Claude failed, often employing another artist to paint in figures for him.

Salvator Rosa and the two Poussins were his contemporaries at Rome, and, although they were somewhat influenced by his style, yet in the works of Ruysdael, Hobbema, Cuyp, and Turner the influence is more evident, both in coloring and in atmospheric effects.

In 1630 he appeared as an etcher and engraver; on the forty-four etchings ascribed to him there are at least eighteen signatures, some in French, and others in Italian. The technique of his drawings is curious, combining lines and wash. The lines are used only to emphasize the shadows and to delineate the figures.

Most of his paintings are in England, but he is also represented in all the important galleries of Europe. In the National Gallery, London, are the "Embarkation of the Queen of Sheba," "Embarkation of Saint Ursula," and a Seaport; in Madrid, the "Finding of Moses," "Embarkation of Saint Paula," "Temptation of Saint Anthony"; in Munich, the "Expulsion of Hagar and Ishmael," "Hagar in the Desert"; in the Louvre, at Paris, the "Landing of Cleopatra at Tarsus," the "Village Dance," six marine views and two landscapes; in the Hermitage, Saint Petersburg, the "Meeting of Jacob and Rachel," the "Flight into Egypt," "Apollo and the Cumæan Sibyl." Consult: Sandrart, *Teutsche Academie der edlen Bau-, Bild- und Malereikünste* (Nuremberg, 1675-79); D'Argenville, *Abrégé de la vie des plus fameux peintres* (Paris, 1745); Pattison, *Claude Lorrain, sa vie et ses œuvres* (Paris, 1884); and Dullea, *Claude Gelée, le Lorrain* (London, 1887).

GELIMER, gél'ī-mēr or jél', or **GILIMER**, gil'ī-mēr or jil'. The last King of the Vandals in Africa. He was a great-grandson of Genseric, the conqueror of Carthage, and founder of the Vandal kingdom in Africa. After deposing his cousin, Hilderic, about 530, and occupying the throne, he was defeated three years later in the battles of Carthage and Bulla by the Byzantine army under Belisarius, and brought as a captive to Constantinople, where he figured in the triumphal procession of the conqueror. He afterwards retired to his domain in Galatia, which had been bestowed upon him by the Emperor Justinian. It is said that when he walked as a captive in the triumphal procession, he realized the futility of the pursuit of greatness, and constantly repeated aloud the words of Solomon: "Vanity of vanities; all is vanity."

GELL, gél, Sir WILLIAM (1777-1836). An antiquary and traveler, the younger son of Philip Gell, of Hopton, Derbyshire. He was educated at Jesus College, Cambridge, where he was graduated B.A. in 1798, and M.A. in 1804; he was for some time a fellow of Emmanuel College in that university. He devoted his time prin-

cipally to topographical and geographical studies, and published in London the following works, which, though not marked by profound scholarship, contain much material of value: *The Topography of Troy* (1804); *The Geography and Antiquities of Ithaca* (1807); *The Itinerary of Greece* (1810); *The Itinerary of the Morea* (1817; new ed. 1827); *Pompeiana: or, Observations upon the Topography, Edifices, and Ornaments of Pompeii*, in conjunction with J. P. Gandy, an interesting and beautiful work (1817-19; second series 1832); *Narrative of a Journey in the Morea* (1823); *The Topography of Rome and Its Vicinity* (1834; new edition by Bunbury, 1846); *Rome and Its Environs* (map, 1834). In August, 1814, on the departure for the Continent of Caroline, Princess of Wales, consort of George IV., she appointed him as one of her chamberlains. In that capacity he attended her in various parts of Italy, but, being attacked with the gout, was soon obliged to resign his situation. In 1820 he was examined as a witness at the bar of the House of Lords during the proceedings against her after she became Queen and had returned to England. Subsequently he resided in Italy, principally at Naples, having a house also at Rome, where he occasionally took up his abode. He died at Naples and was interred in the English burial-ground of that city. His original drawings, about 800 in number, were bequeathed to the British Museum.

GELLATLEY, gél'at-li, DAVID. A half-witted servant of the Baron of Bradwardine in Scott's *Waverley*.

GELLERT, gél'ért, CHRISTIAN FÜRCHTEGOTT (1715-69). The most important of the forerunners of the golden age of German literature that was ushered in by Lessing. He was born at Hainichen, Saxony, and studied theology at Leipzig, where he afterwards passed most of his life as tutor, teacher, and professor, and where he died. His didactic and religious poems, fables, and stories were in their day immensely popular, as were his lectures on morals and literature. His *Works* (10 vols., 1769-74 and 1867) are types of the innocuous and rationalistic. His *Fabeln und Erzählungen* (1746) and the religious poems are still often republished separately. His *Tagebuch* (1869) is the best available biography. Consult also his *Life* by Döring (Greiz, 1833).

GELLIUS, AULUS. A Latin author of the second century A.D. Little is known of his life. He is supposed to have been born at Rome, where, at all events, he studied rhetoric. Subsequently he proceeded to Athens to undergo a discipline in philosophy. On his return to Rome he entered upon a legal career, without, however, abandoning his literary pursuits. Gellius's well-known work, *The Attic Nights* (*Noctes Atticæ*), begun during the long nights of winter in a country house near Athens, and completed during the latter years of his life, is a collection of miscellaneous matter on language, antiquities, history, and literature, in twenty books, of which the eighth is wanting. It contains many extracts from Greek and Latin authors no longer extant. The work is destitute of any plan or arrangement, is disfigured by archaisms, and derives its value mainly from being a repository of curious knowledge. The *editio princeps* appeared at Rome in 1469; the earliest critical edition is that

of Gronovius (Leyden, 1706); the most important edition is that of Hertz (Berlin, 1883-85); there is also a smaller edition by the same author (Berlin, 1886); and a volume of selections, with notes and vocabulary, by Nall (London, 1888). There is an English translation by Beloe (London, 1795).

GELNHAUSEN, gél'n'hau-zen. An ancient town in the Prussian Province of Hesse-Nassau, situated on the River Kinzig, 27 miles northeast of Frankfort. It is surrounded by walls, and its most interesting buildings are the Church of Saint Mary, built in Transition style in the thirteenth century, and recently restored; the Rathaus; and a building dating from the time of Frederick I., and supposed to be a guild house. On a small islet in the Kinzig lie some well-preserved parts of an Imperial palace erected by Frederick I. in the twelfth century. The town has also a monument to Philip Reis, the alleged inventor of the telephone and a native of Gelnhausen. The town once had the rank of an Imperial city, and was the temporary residence of several emperors. Population, in 1900, 4589.

GELON (Lat., from Gk. Γέλων). Tyrant of Gela and Syracuse. He was the son of Dinomenes, and a native of Gela. His family was one of the oldest and most distinguished in the place. Gelon himself first figures in history as general of horse in the army of Hippocrates, Tyrant of Gela. On the death of the latter he contrived to obtain the supreme power, B.C. 491, and about B.C. 485 made himself master of Syracuse also, to which he transferred the seat of his government, and which he rendered the first Greek city in Sicily. All the inhabitants of Camarina, more than half of those of Gela, and many from other neighboring towns, he brought to Syracuse. His influence soon extended itself over a great part of the island. At the time of the invasion of Xerxes, Gelon refused to come to the aid of the Greeks, ostensibly because they would not make him commander-in-chief. He soon after came into collision with the Carthaginians, but defeated them in a decisive battle at Himera, in B.C. 480—on the same day, it is said, on which the battle of Salamis was fought. He thereafter ruled in peace. He is praised as a merciful and wise ruler, who was beloved by his people and hailed as their deliverer and sovereign. After his death, about B.C. 478, he was honored as a hero. His brother Hiero succeeded him.

GELSEMIUM (Neo-Lat., from It. *gelsomino*, jasmine, from Ar. *yasmin*, from Pers. *yâsmîn*, jasmine). A drug consisting of the rhizome and rootlets of *Gelsemium sempervirens*, a climbing shrub of the natural order Loganiaceæ, having a milky juice, opposite lanceolate, shining leaves, and axillary clusters of from one to five large, funnel-shaped, very fragrant yellow flowers. The fruit is composed of two separable jointed follicles, containing numerous flat-winged seeds. The stem often runs under ground for a considerable distance. The plant is a native of the United States, growing on rich clay soil by the side of streams near the coast, from Virginia to Florida and Texas. In the United States it is commonly known as the wild, yellow, or Carolina jessamine, although in no way related to the true jessamines, which belong to the Oleaceæ. The medicinal properties of the root were discovered by accident, the infusion having been administered

instead of that of some other root, with the result of curing the fever for which it was taken. It contains an alkaloid, gelsemine, and gelseminic acid. The physiological action of the drug has been carefully examined. It appears that it has a paralyzing action on the motor centres, affecting successively the third, fifth, and sixth nerves. Its fatal action is due, according to Bartholow, to its causing paralysis of the respiratory muscles, and thus producing death by asphyxia. Wood believes the action is upon the respiratory centre. In large doses it produces alarming symptoms, which have terminated fatally. These appear to vary in different cases, but the more prominent are pain in the forehead and in the eyeballs, giddiness, a feeling of muscular fatigue, lightness in the tongue, slurred pronunciation, labored respiration, ptosis, wide dilatation of the pupils, and impossibility of keeping an erect posture. The mind in most cases remains clear until shortly before death. The earliest and most prominent symptoms of a fatal or dangerous dose is the drooping of the eyelids, which indicates the immediate administration of stimulants; for when the paralysis of the tongue, which ensues, extends to the epiglottis, deglutition becomes impossible, and, unless the sufferer be placed in a forward position, the epiglottis is apt to flap back and close the windpipe. The antidotes which have been found most efficient are carbonate of ammonia, brandy, aromatic spirits of ammonia, and morphine. Gelsemium is used chiefly in the treatment of facial and other neuralgias, particularly the so-called trigeminal neuralgia, which involves branches of the fifth nerve. It has proved valuable in some cases of malarial fever, and is occasionally used as a cardiac depressant and in spasmodic affections, but is inferior for this purpose to other remedies.

GELSENKIRCHEN, gəl'sen-kīrk'en. A thriving industrial town in the Prussian Province of Westphalia, five miles north of Essen (Map: Prussia, B 3). It has extensive iron-works, soap-factories, and flour and saw mills. Its rapid growth is due to the large coal deposits discovered in 1855 in the vicinity. Population, in 1852, 844; in 1890, 28,057; in 1900, 36,935. Gelsenkirchen was made a city in 1875.

GEMARA, ge-mā'rā (Aram., complement). That portion of the two Talmuds, the Babylonian and the Jerusalem, containing the annotations, discussions, and amplifications of the Mishna, or Talmudical law, by the schools of Babylon and Palestine. The Babylonian Gemara is far more complete than the Jerusalem, as well as more lucid, and is a more highly valued authority. It was not completed till about A.D. 800. The Jerusalem Gemara belongs to the middle of the fourth century A.D. See MISHNA; TALMUD.

GEMBOUX, zhān'blōō'. A town of the Belgian Province of Namur, 24 miles southeast of Brussels (Map: Belgium, C 4). It is noted for its Benedictine abbey, founded at the beginning of the tenth century, and now occupied by the Royal Agricultural College. Gembloux is also noted as the scene of the defeat of the Dutch by the Spanish under Don John of Austria in 1578. Population, in 1900, 4216.

GEM'INI (Lat., twins). The third constellation of the zodiac, containing the two bright stars Castor and Pollux.

GEMINUS (Lat., from Gk. Γεμῖνος). A Greek writer, probably of the first half of the first century B.C. His birthplace is unknown, although Rhodes is often given. It is equally uncertain where he lived, the claim on behalf of Rome being insufficiently established. Of his works only one is extant, the *Introduction to Phenomena*, an astronomical work, published with Latin translation by Hilderic (Altorf, 1590), and by Petau, in his *Uranologian* (Paris, 1630), and with a French translation by Halma, in his *Chronologie de Ptolémée* (Paris, 1819). Of his best works, the *Arrangement of Mathematics*, comprising at least six books, was the most important. Fragments of this work have been preserved by Pappus, Eutocius, and especially by Proclus, and form one of the chief sources for the study of the early mathematical history of the Greeks.

GEMISTUS (Lat., from Gk. Γεμιστός), GEORGE, called GEORGIUS PLETHON, and more commonly GEMISTUS PLETHON. A Byzantine philosopher. The exact dates of his birth and death are uncertain, but he is known to have lived between 1350 and 1450. He was probably born at Constantinople, and the greater part of his life was passed in the Peloponnesus, where he probably died, almost a centenarian. He was one of the deputies sent by the Greek Church to the council which was held at Ferrara and Florence in 1438-39, for the purpose of arranging a union between the Latin and Greek churches. Gemistus was more celebrated as a philosopher than as a theologian. In his time the Aristotelian philosophy reigned supreme; but it had degenerated into a mere science of words, from the study of which Gemistus turned away disgusted, and applied himself to Plato. Plato's philosophy so charmed him that thenceforward he devoted himself to its propagation; and in furtherance of this view, when in Italy, induced Cosmo de' Medici to embrace it. Cosmo's example was followed by others in Florence, and thus a Platonic school was founded in the West which flourished for nearly 100 years afterwards. During the latter part of his life Gemistus was engaged in bitter conflicts with the most eminent of the Aristotelians, among whom George of Trebizond held a high position, and the discussion was carried on with unseemly violence. Consult: *Geschichte der Philosophie der Renaissance*, vol. i. (Jena, 1874); Fabricius, *Bibliotheca Græca*, vols. viii., xii.; Migne, *Patrologia Græca*, vol. cix.

GEMMÆ, jēm'mē (Lat., buds). Peculiar vegetative reproductive bodies which are formed upon the thallus of certain liverworts. See HEPATICÆ.

GEMMELLARO, jēm'mēl-lā'rō, GAETANO GIORGIO (1836-1904). A Sicilian naturalist, born at Catania. He was educated in that city and in Naples, and subsequently became professor and rector at the University of Palermo. His researches in archæology and volcanology are valuable; and the Monte Gemmellaro, a volcanic formation caused by the eruption of Mount Etna in 1886, was named after him. His works include: *Descrizione di alcune specie di minerali dei vulcani estinti di Patagonia* (1854-56); *Pesci fossili della Sicilia* (1858); *Studi paleontologici sulla fauna del calcare a Terebratula janitor* (1868-76); *La fauna dei calcari* (1887 et seq.); *I crostacei dei calcari* (1890).

GEMMI (gēm'ē) **PASS.** A mountain pass across the Alps in Switzerland, lying at an altitude ranging from 3900 to 7570 feet, and connecting the cantons of Bern and Valais (Map: Switzerland, B 2).

GEMMULE (from Lat. *gemma*, little bud, diminutive of *gemma*, bud). In biology, (1) a mass of cells cut off from the parent for reproduction; (2) a hypothetical self-multiplying particle upon which inheritance depends.

(1) Among animals, gemmules are found in the groups of sponges and Polyzoa. In sponges, as winter approaches, numbers of the migratory cells form an aggregation in which two layers are eventually distinguishable. The central cells are loaded with yolk; the cells of the outer layer become club-shaped and arrange themselves in a sort of high epithelium. This layer of cells secretes a cuticular membrane around the inner mass of cells, and forms a layer of dumbbell-shaped spicules close set in a radial fashion. The central cells are those from which the embryo is to arise next spring. The outer layer is protective. The gemmules thus constituted are set free when winter kills the sponge tissue. Next spring the inner cells grow and the bonds of the outer layer are broken. Such gemmules are found chiefly in fresh-water sponges, but within the last decade they have been found in marine sponges also. In the fresh-water Polyzoa the gemmules are of somewhat different character, and are called statoblasts. The statoblast arises in a special thread-like organ, the funiculus, that is composed of ectoderm within and of mesoderm without. The ectodermal core proliferates to form a hollow square, which later flattens and eventually produces the tough cuticula by which the statoblast is covered. The outer mesodermal layer thickens, stores food-material, and becomes enveloped by the ectoderm. In addition to the cuticula, which the ectodermal layer secretes, the statoblast is often provided with spines and a float which permits the statoblast to swim. In the spring the embryo develops within the brown cuticula, bursts open this shell, and emerges to lay the foundations of a new colony. Both of the foregoing gemmules are devices for enabling the species to outlast the winter.

(2) The hypothetical material basis of inheritance called *gemma* by Darwin has been recognized by one name or another by almost every philosophic writer in biology; other nearly or quite synonymous terms are the physiological units of Spencer, the bioblast of Beale, the pangene of De Vries, the plasome of Wiesner, the micella of Nägeli, the plastidule of Haeckel and Ellsberg, the biophore of Weismann, somacule of Foster, idioblast of Hertweg, idiosome of Whitman, biogen of Verworn, and *gemma* of Haacke. The hypothesis has arisen on account of the necessity of assuming a structure to protoplasm intermediate between the visible foam-work and granules and the invisible molecules. The line of argument is briefly this: The qualities of the adult are inherent in the egg, and also in each of the cleavage spheres; each quality is represented by material particles, which divide when the cell divides; the particles are not molecules, for it is hardly conceivable that a molecule stands for a somatic quality; therefore there must be some sort of unit groups of interacting and internally associated molecules. Darwin's

hypothesis (see PANGENESIS) was that each cell threw off one or more gemmules; they floated in the blood to the germ-cells and became lodged in these cells. Galton tested this theory by transplanting the blood of one species of hare into a second. The progeny of the second was not influenced by the blood of the first species. Weismann believed in no such migration of gemmules. The gemmules of the germ-cells receive no influx of gemmules from outside by which their characters might be changed; on the contrary, the composition of the germ-cells is unchanged, says Weismann, except as a result of crossing or internal spontaneous modifications. See EMBRYOLOGY.

GEMOTE, ge-mōt' (AS. *gemōt*, assembly): Among the Anglo-Saxons, the public assembly of freemen or men of noble rank for the purpose of legislative and judicial action. Besides the great council of the nation, the witenagemot (q.v.), there were among the Anglo-Saxons various minor motes or moots, which were local bodies dealing with local affairs. There was a *shire-gemot*, or county court which met usually twice a year; the *burg-gemot*, which met thrice annually; the *hundred-gemot* (see HUNDRED), which met every month, and an extraordinary meeting of which was held twice a year; and the *halle-gemot* or *court baron*. These institutions are regarded as being derived from the old Teutonic assemblies where every freeman had a voice, and where a clashing of arms betokened the approval, and a groan the rejection of a plan.

GEMS (from Lat. *gemma*, bud). While the term *gem* is ordinarily applied to jewels and other valuable and precious stones, it is used in archæology of cut or engraved stones of the precious kinds, and even small engraved portions of hard rocks set or worn as jewels.

Although the principal varieties of precious stones were known to the ancients, yet owing to the absence of scientific and chemical analysis, they appear to have distinguished precious and other stones only by color, specific gravity, and density. The different nomenclature, too, used by different authors, multiplied synonyms and caused confusion; so that it has become impossible to identify all the stones mentioned by Theophrastus, Pliny, and others. As a general rule, the ancients did not engrave such precious stones as the diamond, ruby, and sapphire, being content with those of less hardness and value. The principal stones used by engravers were: (1) The carnelian, and its more transparent variety the sard, *sardion*, in common use in the days of Plato (so called from Sardis in Lydia, but chiefly obtained from India and Babylonia); (2) the chalcedony, supposed to be the ancient calchedonion, used for seals and reliefs, of which two kinds have been found; (3) the *onyx* or nail-stone, variously described by Pliny and his predecessors, but distinguished by a white layer resembling the nail; (4) the *niccolo* or *Ægyptilla*, obtained from the onyx, a blue spot with a black zone encircling it; (5) the *sardonyx*, which was a variety of the onyx, having black, blue, white, and red colors, and particularly used for cameos and vases, by cutting down the lighter-colored layers to the darkest for a background to the figures; (6) the *agate* or *achates*, so named from a Sicilian river, embracing many varieties, as the *jaspachates*, *dendryachates*, but confounded with the *jasper*,

considered a charm against scorpions and spiders, used for whetstones, and as a talisman by athletes; it was obtained from Egypt, Greece, and Asia; (7) plasma or the *prasius*, root of emerald; its varieties were the *molochates* and *nilion*; (8) numerous varieties of the jasper, *iaspis*, green, blood-red, yellow, black, mottled or porcelain, and even blue, were employed for signets at the Roman period, and procured from India, Persia, and Cappadocia; (9) garnets, the *granatici* or red hyacinths of antiquity, which were principally in use in the latter days of the Roman Empire, and among the Oriental nations. With these may be classed: (10) The *carbunculus*, supposed, however, by some to be the name given by the ancients to the ruby, brought from India, Caramantia, Carchedon, and Anthemusia; (11) the *hyacinthus* or jacinth, a yellow variety of the garnet, used for signets, and imported from Ethiopia and Arabia; (12) the *lyncurium*, or *lychnis*, the ancient name of the true modern jacinth; (13) several varieties of the emerald or *smaragdus*, as the Bactrian or Scythian, supposed to be a green ruby, principally derived from the emerald mines at Zabora, in the neighborhood of Coptos; (14) the beryl or *beryllus*, obtained from India, cut in shape of a hexagonal pyramid, used at an early period, and for engraving; (15) the *amethyst*, brought from Arabia Petræa and Armenia Minor, used for intaglios at all periods; (16) the *sapphirus* of the ancients, supposed by some to be lapis lazuli, brought from Media, and in use among the Egyptians and Persians; (17) the *anthrax*, supposed to be the ruby; (18) the topaz, *topazon*, a name applied by the ancients to a green stone found by the Troglodytes in the island of Cytis, in the Red Sea, and first sent by Philemon to Berenice, out of which a statue of Arsinoë was made and placed in the so-called 'golden temple' by Ptolemy Philadelphus; (19) the *chrysolithus*; (20) chrysoprase, turquoise *callais*; (21) the *magnes*, or lodestone, used for cylinders and gems of a late period; (22) the green tourmaline, or *avanturine*, *sandaresus*; (23) the obsidian, *obsidianus*, four elephants made of which were dedicated by Augustus in the Temple of Concord; besides which we read of a statue of Menelaus, made of the same material, returned to the Heliopolitans by Tiberius; (24) the *opal opalites*, or *pæderos*, obtained from India, the largest of which then known was of the size of a hazel-nut; (25) the *adamas*, of which seven varieties were known to the ancients, used only for cutting other gems, or worn rough, but not engraved, or even faced. The list of Pliny, indeed, contains many other stones which have been either confounded with those already described, or else they are species of the same. Many of these had fanciful names, as (26) the *aromatites* of Arabia and Egypt, so called from its fragrance; (27) the *alectorius*, worn by the wrestler Milo, so called from being taken out of the gizzard of a fowl; (28) the *aspidates*, a fiery stone, said by Democritus to be found in the nest of the Arabian birds. In the selection of stones for engraving, the gem-engravers adapted the material to the subject. Bacchanalian subjects were often engraved on amethysts; marine, on beryls; martial, on carnelians, sards, and red jaspers; rural, on green jasper; celestial, on chalcédonies. Virtues were also superstitiously attributed to the different varieties of gems. Thus the amethyst was sup-

posed to protect from the influence of wine; according to Dioscorides, the jasper was particularly adapted for amulets; and Alexander of Tralles recommends the subject of Hercules, engraved on a Median stone, to be worn on the finger as a remedy against the colic. These superstitions were collected in various writings, like the *Physiologus*, some of them attributed to Saint Augustine.

The art of engraving precious stones at the earlier periods of the Egyptian monarchy was comparatively unknown, although beads were cut out of almost every known stone. For the purpose of seals, however, and for intaglia, steatite scarabæi were generally used, and engraved gems are either of the greatest rarity or of suspicious genuineness till the time of the Ptolemies. A very remarkable exception to this rule is a square signet of yellow jasper, engraved with the name and titles of Amenophis II. (about B.C. 1450) and his horse, in the British Museum. Figurines of deities and animals were, however, numerous, and were carved out of amethysts, emeralds, agates, sardonyx, carnelian, obsidian, hæmatite, lapis lazuli, etc. There are in museums numerous cats, lions, crocodiles, eagles, frogs, hippopotami, and other symbols. Under the Ptolemies and Romans, the Gnostic gems, called *abraxas*, generally of lapis lazuli, bloodstone, and jasper, begin to appear, but these are made by the same process as the Greek, from which they were derived. The Ethiopians, according to Herodotus, engraved signets. But the earliest engraved gems were those of the Babylonians, always, until a late period, in the form of cylinders from one to two inches long and about one-half or three-quarters of an inch thick, pierced through their long axis for a cord or pin, and used for impressing the sign-manual by rolling on soft clay. Their universal use multiplied them to such an extent that they form our main source of information as to the periods and themes of Babylonian sculpture; the favorite theme was the figures of the patron god and goddess being worshiped by the owners of the gem, and the figures are arranged in a single frieze-like row. There are also many scenes purely mythological, such as the legends of Gilgamesh, the Babylonian Hercules, of Merodach, of Samas, of Raman, and other deities. The seals of the ancient Kings Sargani (c. 3850 B.C.), Naramsin (c. 3800), and Ur-gur (c. 2800 B.C.) are of good art, as are those of Gilgamesh breaking the lion's back, of the captives of Erech, etc. In style there were many schools and periods, at opposite poles of art, but their history is obscure. There is a radical difference in the technique of Assyrian gem-cutting; the outlines are sharp instead of rounded and the details very clear, there is less use of the nude, and a narrower range of themes. It was the Assyrian style which most influenced the gem-cutting of Persia: the seal of Darius, with the King in his war-chariot, is only a puny copy of the corresponding spirited Assyrian scenes. In late Assyrian times the rolling cylinder was partly replaced by the conical signet with figures cut on the base. All the Orient had copied Babylonian models. The Phœnicians, Hittites, Syrians, and other races all used cylinders of similar style. A cruder style, with animals and heads, came into vogue under the Parthians, often accompanied with Pahlavi inscriptions, and these probably continued till the rise

of Mohammedanism in the East, when the art was confined to the engraving of Cufic legends on the most valuable of Oriental stones, often with a great degree of dexterity. Before this time there had been introduced a greater variety in the form of the cut gems, conical chalcedonies, and other stones, hemispherical agates, convex stones *en cabochon*, such as garnets, sards, carbuncles, engraved on their upper surface. In Judea the use of signets (see RING) prevailed, and the most important known instance is the Urim and Thummim, or breastplate of the High Priest, consisting of twelve precious stones, engraved with the names of the twelve tribes; but no Hebrew engraved stones earlier than the fifth or sixth century B.C. are known. Among the other Oriental nations, the Iranians and Hindus seem to have exercised the art of engraving on stones, although no works of great merit of these nations have been found. Of other nations of antiquity, the Chinese only had seals of crystal, soapstone, porcelain, and other substances, with devices in relief for using as stamps, the subjects being mottoes from poetical and other works.

Archæological research has shown that the Greeks cut gems at a very early date. The first or *Mycenæan* period used animals, flowers, and hunting scenes, fishes and marine plants; the second or *Oriental* period (c. 900-700 B.C.) introduced the human figure and mythological scenes more freely; the third or *Archaic* period (B.C. 700-500) shows the influence of large sculpture and coins; the fourth or *developed* period (500-320) produced certain great artists, like Athenades, Dexamenus, Phrygillus, Olympius, and Onatas, whose work corresponds on a small scale to the golden age of monumental sculpture. Finally the fifth or *Hellenistic* age, beginning with Pyrgoteles, privileged to work for Alexander the Great, was the age of high finish, dramatic style, and love of the grandiose, so that it fitly saw the use of the art of cameo-cutting, and the use of large heads and elaborate compositions. The Greeks, at the earliest period, are not supposed to have employed engraved stones for their signets, the earliest rings being of solid metal, such as the legendary ring of Minos; but at a later mythological period those of Helen, Ulysses, and Gyges are said to have had engraved stones. Orestes, in the tragedies, is also recognized as the son of Agamemnon by his engraved ring; and Mnesarchus, the father of Pythagoras, who lived about B.C. 600, was an engraver of gems. The earliest instance of an engraved gem is the emerald ring of Polycrates, set in gold or engraved by Theodorus of Samos about B.C. 540; while the laws of Solon against counterfeiting signets show that they had been in early use. At the period of the Persian wars they were by no means uncommon. Later, the writings of the Platonists and Stoics constantly allude to gems, and the flute-player Ismenias (B.C. 437) purchased an emerald engraved with the figure of Amyclone. One of the Ptolemies presented as a most precious gift his portrait engraved on an emerald to Lucullus; and Cleopatra had a gem with Bacchus. The style of engraving of this age is fine and noble, the hair indicated by fine wiry lines; the subjects are generally heroic, but busts and portraits of divine, regal, and historical personages appear. Sardes, amethysts, and jacinths were in use.

Contemporaneous with the Archaic Greek school

was the Etruscan, among whose products were scarabs entirely carved out of sard, carnelian, and agate, with engravings often of exquisite work, but generally harsh, and sometimes of severe style, with subjects derived from the earliest Hellenic myths, and occasional inscriptions in the Etruscan language, the names of the personages represented, seldom more than one figure appearing on the gem. The subject is surrounded with a guilloche or engrailed border, and the scarabs were pierced through their long axis, to set as rings or to wear as other objects of attire. The contents of Etruscan tombs show how the numerous imported gems, both Oriental and Greek, furnished the models to native artists. The imitation 'Island stones' and scarabs were sometimes of bone or composition. Similar scarabs, but of green jasper and of Phœnician workmanship, have been found in Sardinia. The Romans of the later Republic collected and copied Etruscan, and especially Greek, engraved gems, largely set as rings. The device of Scipio Africanus was a head of Syphax; that of Sulla, the submission of Jugurtha; of Pompey, a lion carrying a sword; and of Cæsar, Venus armed with a dart. So greatly had the passion for these charming little works of art increased that Scaurus, the stepson of Sulla, had a collection of gems, *dactyliotheca*. Pompey sent the collection of Mithridates as an offering to the Capitol; Cæsar, to outvie his great competitor, presented six such collections to the shrine of Venus Genetrix; and Marcellus, another to the cella of the Palatine Apollo. At the commencement of the Empire, the portraits follow the costume and art of the period; the hair is expressed by broad strokes, the compositions rarely contain more than two figures. Artists of great merit, as Dioscorides, Apollonides, and Chronius, flourished at this age.

The names of the artists who engraved the gems, and of the proprietors, are occasionally found upon them. After the Antonines, indeed, the art rapidly declined, and portraits after Severus are rare, although even that of Mauricius is said to occur. At the middle period of the Empire, the work is exceedingly rude, often merely scratched out by a diamond point in carnelians, jaspers, and garnets. The gems of this latter period are sometimes square, generally, however, the long or convex oval. The *camei*, or gems in relief, the ancient *ectypa sculptura*, appear prominently at the period of the Roman Empire. This term *camei*, of uncertain origin, is applied to engravings on stone of two or more layers, such as the onyx or sardonix, and niccolo, and is different from the relief gems cut out of stones of one color. Ancient *camei*, indeed, are of the greatest rarity. The smaller ones were used for rings; the larger, which are often perforated, are supposed to have been often attached to the dress as *phalæra*. They were worked out with the diamond point. Cameos are not supposed to be earlier than the Alexandrian period (c. 200 B.C.), though some carnelian scaraboids of Archaic Greek times, like several in the British Museum, are small premonitory specimens of what was to be developed into the most gorgeous branch of gem-carving, whose brilliant coloring and large size hardly accorded with the Hellenic simplicity of the Golden Age. The first great cameos are those of the Ptolemies, such as the great Naples

cameo of Zeus by Sosus, that of Ptolemy and Arsinoë in the Hermitage of Saint Petersburg, the onyx cap of Ptolemy at the Cabinet des Médailles in Paris, the famous Farnese cup, the vase of Saint Martin d'Agaune—all masterpieces, and serving as models for the artists of the Augustan age. To the early Roman Empire belong some superb pieces, such as the "Triumph of Augustus," a sardonyx in the Vienna collection, and the so-called "Apotheosis of Augustus" in the Bibliothèque Nationale in Paris, also a sardonyx. The composition in these Roman works is elaborate, and the figures numerous and sometimes in several rows. On the Vienna sardonyx Jupiter, Augustus, and Roma are enthroned above, in the middle row are Terra, Ocean, Abundance, Germanicus, Victory, and a triumphal chariot, while below are German and other captives. The cameo at Saint Petersburg is one foot long, and that in the Marlborough Collection, with the heads of Didius, Julianus, and Mantic Scantilla, is eight and one-half inches long by six inches high. Still larger carvings are in the form of vases, cups, boxes. These gems were principally worn as objects of attire, and Heliogabalus is even said to have placed intaglio in his shoes. The names of artists are rarely found upon camei; a celebrated one of the Marlborough Collection, indeed, has the name of Tryphon, but there is considerable doubt about the authenticity of the inscription.

The subjects of classic gems embrace the whole circle of ancient art, and follow the laws of its development, animal forms being succeeded by those of deities and subjects derived from the battles of Greeks and Amazons and centaurs, the exploits of Hercules and other heroes; then by scenes from tragedians and later myths; and finally by portraits, historical representations, and allegories. The inscriptions consist of the names of artists (generally forgeries), sometimes in the genitive case, but often accompanied with the verb *érolé*, made; addresses to individuals; gnomic or other sayings, indicating that the gems are amulets against demons, thieves, and various evils; or charms for procuring love; the names of the possessors, and sometimes addresses, occasionally even distichs of poetry, and various mottoes. These inscriptions were often added by subsequent possessors, and are not of the age of the gem itself. The number of artists, although very considerable, does not exceed 22 authentic names. The number of false antique stones produced by eminent engravers since the revival of the arts has rendered the diagnosis of gems so difficult that no branch of archæology requires greater judgment. All gems of high artistic merit and great finish are suspected, especially those with groups of many figures, regular edges, and polished faces, or too great a polish in the deep parts. Coarser imitations have been produced by backing pastes or colored glass (see GEMS, IMITATION) with stones, and mounting them in rings so as to pass for gems. The appearance of wear and friction has been produced by introducing them for a while into the gizzards of turkeys, or in pierced boxes plunged in the beds of rivers. The judgment upon gems can be matured, however, only by a careful study and familiarity with all branches of ancient art. The coarser imitations of pastes, the tongue, the file, and the graver will detect; but old gems reengraved, or new compositions invented, require the most care-

ful survey. The place or circumstances of discovery are no guarantee against deception, the commerce in false antiques being successfully plied upon the unwary even in the far East.

The chief implement used by the ancient engravers appears to have been made by splitting diamonds into splints by a heavy hammer, and then fixing these points like glaziers' diamonds into iron instruments, with which the work was executed by the hand. The drill was also extensively used for hollowing out the deeper and larger parts of the work, before the diamond-point was brought into operation, and finally, emery powder was used for polishing. The wheel, a minute disk of copper, secured to the end of a spindle, and moistened with olive oil, emery powder, or diamond-dust, and driven by a lathe, does not appear to have come into use till the Byzantine epoch. It has been conjectured that the artist used lenses of some kind, or globes filled with water, to execute his minute work; but the ancient, like the modern engraver, rather felt than saw his way. A more primitive method was that in which nothing but a copper tool was used, moistened as described. A still more primitive technique is that of many rude, early, or provincial Babylonian cylinders and proto-Hellenic 'Island stones' where the drill is the only instrument, and the forms are indicated either by larger or smaller hollows connected usually by straight lines. All these processes were not employed by the same artist, for besides the engraver (*sculptor cavarius, dactyliographus*), there was a polisher (*politor*), not to mention arrangers (*compositores gemmarum*), and merchants (*gemmarii, mangones gemmarum*).

The decadence in sculpture was very quickly felt in gem-cutting, which produced little and that of hardly any value, after the second century A.D. Even the small skill shown in Gnostic and Early Christian examples was lost, and the Merovingian and Carolingian monarchs, except in the case of monograms engraved on signet rings, were obliged to use antique gems, instead of those engraved by the artists of their day. Rock-crystals, however, were employed in a Byzantine style of art, with sacred subjects, in the ninth century; and a few other examples have been preserved in the Treasury of Saint Mark's at Venice, and in Paris (Bibliothèque Nationale). The art was all but lost in the West, except for a few pieces such as the Gothic rings of the Guerrazar treasury, the seal of Lothair at Aila-Chapelle, and the Crucifix of Conques. It was revived in the time of Lorenzo de' Medici, when Giovanni delle Corniole, at Florence, and Domenico dei Camei, at Milan, worked under his patronage. A subsequent school of gem-engravers originated with Pietro Maria da Pescia, who worked for Leo X.; the chief representatives of the school are Michelino, Matteo de' Benedetti, the celebrated painters Francia, M. A. Moretti, Caradossa of Milan, Leonardo da Vinci, J. Tagliacarne, Giovanni Bernardi of Castel Bolognese, celebrated for a Titus copied from Michelangelo. These were succeeded by Matteo del Nassaro of Verona, who worked for Francis I., and produced a crucifixion on heliotrope, so that the red spots seemed drops of blood issuing from the wounds of Christ; Caraglio, who flourished in Poland about 1570; Valerio dei Belli, who chiefly employed rock-crystal; Marmita, Domenico di Polo, Nanni, Anichini of Ferrara, and Alessandro Cesari, cele-

brated for a cameo head of Phocion; Dei Rossi, a Milanese, who engraved the largest cameo of modern times; Giacomo da Trezzo, celebrated for his portrait, who is said to have been the first to engrave on the diamond (in 1564), an honor disputed, however, by Birago, another Milanese, who made a portrait of Don Carlos and the arms of Spain on this gem.

The art, which had declined at the close of the sixteenth century in Italy, flourished in the seventeenth century in Germany under Rudolph II., for whom Lehmann engraved at Vienna; and in France, where Colderé worked for Henry IV. and Louis XIII. In the seventeenth century Sirletti, who died at Rome in 1737, excelled in portraits, and copied antique statues with great excellence. The two Costanzi were celebrated about 1790, one for the head of Nero on a diamond. Rega of Naples is said to have come nearest to the antique. Natter of Nuremberg, who died in 1763, is celebrated for his intaglia; Guay and Barrier were celebrated in the French school; and the English produced Reisen, who died in 1725; Claus, who died in 1739; Smart, celebrated for the rapidity of his works; and his pupil Seaton, a Scotchman, who engraved portraits of the great men of his day. The greatest artist of the age, however, was Natter. Of the subsequent Italian school, Ghinghi, Girometti, Cerbara, Bernini, and Putentati are much praised. The nineteenth century produced many good English engravers, as Marchant, Burch, Wray, and Tassie; while Pistrucci, celebrated for his charming cameo, Weigall, and Saulini, who made intaglia, complete the list of modern gem-engravers.

With respect to ancient gems in the Middle Ages, they were preserved in magnificent book-bindings—especially of manuscripts of the Bible—in reliquaries, ciboriums, shrines, chasses, and other ecclesiastical vessels, in which they were set. The collections of Saint Mark's, Venice, of Aix-la-Chapelle and other churches, the Bibliothèque Nationale at Paris, the cabinets of the museums of Florence, Vienna, Saint Petersburg, etc., show how this was done by Byzantine, Carolingian, Romanesque, and Gothic artists. The collecting of antique gems for their own sake, as examples of ancient art, commenced with Lorenzo de' Medici, who formed the Florentine collection, and had his name incised on his gems. The large camei of the European collections, however, appear to have been brought by the Crusaders from the East. The French collection dates from Charles IX., and was augmented by the successive Kings of France; it is very rich in gems of all kinds; that of Berlin, containing the united cabinets of the Elector of Brandenburg and the Margrave of Anspach, collected by Stosch, consists of nearly 5000 stones. The Vienna collection, far less numerous, is remarkable for its large camei. In England, the collection of the British Museum, collected originally by Townley, Hamilton, Payne, Knight, and Cracherode, consists of about 1500 stones, some of great beauty and merit, but is very poor in camei. The private collection of the Duke of Devonshire, formed in the last half-century, comprised upward of 500 intaglios and cameos, including some of the finest known. The Pulzky collection, now in Italy, contains many rare and choice intaglios. A celebrated collection, the Poniatowsky, formed upon the basis of the old collection of Stanislas, last King of Poland, was so filled with forgeries

by its last possessor, executed by Roman artists, with inscriptions by Diez, that it entirely lost its value on dispersion. The Hertz collection was remarkably rich in fine Etruscan scarabæi, and other intaglios. The Tyszkiewicz collection, recently dispersed, has enriched the Boston Museum with many fine pieces. The Morgan collection, in the American Museum of Natural History, New York, begun in 1890 and added to in 1901, is one of the largest modern collections of gems. There are probably about 10,000 gems reputed to be antique. Yet these are only a mere installment of those formerly existing. During the Renaissance very numerous and successful imitations of antique gems were made, and the signatures of Greek and Roman artists were manufactured. Such forgeries are still so frequent as to cast suspicion on the entire subject. The immense value placed by the ancients on their gems may be seen by the scabbard of Mithridates, valued at 400 talents, or \$37,860; the pearl given by Julius Cæsar to Servilia, worth \$24,000; that swallowed by Cleopatra, valued at \$25,000; and the pearls and emeralds worn by Lollia Paulina, wife of Caligula, valued at \$1,600,000—all the spoils of provinces and the heirlooms of her family. These, indeed, were probably not engraved, but in modern times great sums have been paid to celebrated engravers—as much as \$4000 for one cameo.

Although the acquisition of gems is too costly for most private individuals, impressions in glass called pastes (see GEMS, IMITATION), in sulphur, guttapercha, or plaster of Paris, can be easily obtained, and they answer almost all the purposes of study. Some ancient impressions in terracotta, indeed, exist, and the poorer classes of Greece and Rome were content with glass pastes. The principal writers of antiquity who treated of gems are Onomacritus or the Pseudo-Orpheus, Dionysius Perigetes, Theophrastus, and Pliny, whose chapter is compiled from antecedent Greek and Roman authors. Isidorus (A.D. 630) gives an account of the principal stones; so do Psellus and Marbodius in the eleventh century. The best general account is in Babelon, *Les gravures en pierres fines* (Paris, 1894); and King, *Handbook of Engraved Gems* (London, 1885), is still an authority. Middleton, *Engraved Gems of Classical Times* (Cambridge, 1891), is an excellent handbook, both technical and historical, for the Græco-Roman period. A pioneer for the Babylonian, Assyrian, Syrian, Phœnician, and Hittite schools is Ménant, *Les pierres gravées de la Haute Asie* (1883-86). Consult, also: Dana, *Manual of Mineralogy and Lithology* (3d ed., New York, 1878); Kunz, *Gems and Precious Stones of North America* (New York, 1890). The best catalogues of the large museum collections are: *Catalogue of Engraved Gems in the British Museum* (London, 1888); Babelon, *Le cabinet des antiques à la Bibliothèque Nationale* (Paris, 1889); id., *Catalogue des camées antiques et modernes de la Bibliothèque Nationale* (Paris, 1897).

GEMS, IMITATION AND ARTIFICIAL. The high appreciation in which gems were held by the ancients naturally led to the manufacture of imitations, and as early as the time of Pliny imitation opals and emeralds were well known. Seneca mentions that Democritus invented a

process for making imitation emeralds by giving a green color to rock crystal. According to Saint Thomas Aquinas, emerald, hyacinth, ruby, sapphire, and topaz were made in the twelfth century. The 'Sacro Catino' of the Cathedral of Genoa, and the celebrated table of Solomon taken by Vespasian from the Temple at Jerusalem, are known to have been imitations, and powder of crystal was largely used in the manufacture of imitation gems among the Romans, with the result that thousands of spurious gems accurately imitating the sapphire and the ruby were passed upon the uninitiated; indeed, modern examination shows that many of the famous gems of antiquity were made simply of glass.

IMITATION GEMS. Imitation gems may be divided into two classes—namely, mineral substitutes and doublets, and gems made from substances treated by chemical means. The first class includes quartz, white Brazilian topaz, and the colorless varieties of beryl, emerald, sapphire, and zircon, which have been sold as diamonds. Colored varieties of quartz are frequently substituted for other gems; thus, the yellow varieties, as cairngorm and citrine, are sold as topaz, and the purple varieties of quartz as the Oriental amethyst. The application of heat to certain gems, such as topaz and sapphire, frequently renders them colorless, and increases their brilliancy, in consequence of which they are cut and sold as imitation diamonds. Doublets are thin plates of a genuine gem attached to a valueless backing by means of a thin layer of gum mastic. Those imitation gems that are made by chemical processes are generally a special variety of glass known as *paste*, or *strass*, which consists of pure powdered quartz (preferably rock crystal) 38.2 parts, red lead 53.3 parts, and dry potassium carbonate 7.8 parts. These proportions admit of considerable variation, and arsenious oxide, borax, potassium nitrate, aluminum hydroxide, and calcium carbonate are also frequently added. The ingredients are powdered separately, carefully mixed, and heated in a sand crucible. The heat is gradually raised to fusion, and is maintained and carefully regulated at that temperature for about thirty hours, after which it is gradually lowered. The value of the product depends chiefly on the regularity of the temperature, the intimacy of the previous admixture, and the slowness of cooling, and is much increased by prolonged fusion.

This glass forms the basis of nearly all of the imitation gems, and the imitation diamonds are cut directly from it. The required tint for the colored gems is imparted by the solution in the paste of certain metallic oxides and other substances, as is shown in the following formulas: *Amethyst*, paste 1000 parts, glass of antimony 8 parts, cobalt oxide 5 parts, purple of Cassius 0.2 part; *beryl*, paste 1000 parts, glass of antimony, 7 parts, and cobalt oxide 0.4 part; *carbuncle*, paste 1000 parts, glass of antimony 500 parts, purple of Cassius 4 parts, and manganese dioxide 4 parts; *emerald*, paste 1000 parts, copper oxide 8 parts, and chromium oxide 0.2 part; *garnet*, paste 1000 parts, with variable proportions of purple of Cassius; *ruby*, paste 1000 parts, glass of antimony 40 parts, purple of Cassius 1 part, and gold 1 part; *sapphire*, paste 1000 parts, cobalt oxide 14 to 25 parts; *topaz*, paste 1000 parts, glass of antimony 40 parts,

and purple of Cassius 1 part. The temperature at which these mixtures are fused, and the time occupied in fusion, naturally affect the product, and the proportion of the colorless ingredients also varies considerably. The manufacture of these imitation gems is an important industry in Switzerland and in various parts of France and Germany. Agate, carnelian, chalcedony, and onyx, for making jewelry and for engraving, have been artificially stained at Oberstein and elsewhere in Germany. The stones are soaked in oil or other organic liquid, and then boiled in strong sulphuric acid. The organic matter absorbed by the stone is thus carbonized, and a black color is produced. A red color may be obtained by soaking the stone in a solution of ferrous sulphate, and a deep blue color results by afterwards soaking in a solution of potassium ferricyanide.

The manufacture of imitation pearls is an important industry. The pearls are made by coating the inner surfaces of glass beads with a preparation made from the scales of certain fishes. This extract is prepared as follows: Several pounds of scales are washed in fresh water to remove dirt, and they are then churned for several hours in cold fresh water, and the mass subjected to pressure in a linen bag. The silvery, lustrous runnings are caught and set aside, and the operation repeated until the scales have lost their silvery appearance. The runnings, to which a little ammonia has been added, are put aside to clarify, care being taken to prevent putrefaction. The sediment is washed repeatedly with fresh water and left to settle; when the washings are quite clear the lustrous sediment is bottled with its own volume of alcohol, shaken, and allowed to settle. The alcohol is then decanted off, and the operation repeated until the sediment has lost its water and is of the consistency of butter. For use, the preparation is mixed in small quantities with a hot aqueous solution of gelatin, to which a small quantity of alcohol has been added. In the manufacture of colored pearls the desired shade is obtained by the addition of some suitable coal-tar dyestuff.

ARTIFICIAL GEMS. In recent years the production of gems by artificial means has been attempted by chemists, and the literature of the manufacture of diamonds by heat is extensive; but as yet no large stones have been obtained. In 1880 Hanney, in some experiments made to produce diamonds artificially, obtained some hard particles which experts declared to be diamonds; but as the expense was five times the value of the natural stones, the process was not a commercial success. Later, by means of the electric furnace, Moissan (q.v.) not only succeeded in preparing minute diamonds, but also accomplished the synthesis of other gems by means of the high temperatures obtained by him. Sainte-Claire Deville and Caron, in 1858, described various processes by which they obtained small crystals of white and green corundum, rubies, sapphires, etc. Frémy and Feil, in 1877, were able to produce crystals that possessed the form of natural rubies and easily scratched topaz. By adding cobalt oxide before fusion, they obtained sapphires. In 1888 Frémy and Verneuil announced their successful preparation of artificial rubies by heating to redness a mixture of barium fluoride and alumina containing a trace of potas-

sium bichromate. Ebelmen, from the mixtures of oxides of aluminum and glucinum, using boracic acid as a solvent, succeeded in obtaining (at a very high temperature) artificial spinels and chrysoberyls. Hydrofluoric acid and silicon fluoride have also been used to induce combination between silica and other oxides. By this method topaz, which is a complex fluosilicate, has been made by the action of fluoride of silicon upon alumina. More recently the manufacture of artificial rubies has been successfully accomplished in Paris on a large scale, and gems having a pure transparency, with the rich red color of the pigeon's-blood ruby, have been produced and placed on the market. Crystals of over 40 carats in weight, valued as high as \$25,000 each, are said to have been recovered.

The electric furnace has yielded another product which, while strictly speaking it is not a synthetic gem, is nevertheless essentially an artificial gem. Imperfect rubies, chips, and small stones are fused in the furnace, together with a small amount of coloring oxide, such as that of chromium. The fused product is then cut and polished, and the result is a gem of good color and fairly large size. Emeralds and other colored stones have been made by this method, and so important has the industry become that the courts have been called upon to decide what constitutes an artificial gem. A decision which has applied to the rubies was obtained, in which it was decided that that word applied only to the red-colored corundum or anhydrous aluminum oxide that also occurs already formed in nature.

Consult: De Fontenelle and Malepeyre, *Glass, Artificial Stones, etc.* (Paris, 1854); Streeter, *Precious Stones and Gems* (London, 1879); Tassin, *Descriptive Catalogue of the Collections of Gems in the United States National Museum* (Washington, 1902).

GEMS'BOK (Dutch, chamois-buck). A large South and West African antelope (*Oryx gazella*), representing a group which contains the beisa (q.v.) and similar straight-horned antelopes of the North. (See Oryx.) It is a heavy,



HEAD AND HORNS OF GEMSBOCK.

stout animal, about four feet high, with rough, reversed hair on the neck and along the ridge of the back; large, pointed ears; and almost perfectly straight horns, sometimes over a yard long, in the plane of the forehead, little diverging, and ringed at the base. The colors are harshly contrasted, dark rusty-gray above, and white on the under parts, separated by a broad dark-brown or black band; the head white, with black traverse bands; the thighs black, and the legs white. The hoofs are remarkably long, and well adapted to the rocky mountainous districts which the animal frequents. It will thrive in utterly waterless and apparently barren deserts; goes about in pairs or small bands, and is by no means fleet of foot; but in lieu of speed for

escape is able to defend itself against even the lion with its spear-like horns, which are sought by the negroes to be converted into weapons. Its flesh and hide are highly esteemed.

The 'bastard gemsbok' of the Boers is the roan antelope (q.v.).

GEMS'HORN (Ger., chamois-horn). A well-known stop in German organs, the pipes of which are made of tin, and are conically shaped, being much narrower at the open end; while at the mouth (the broad end) there are ears on each to regulate the tuning. It has a peculiarly pleasing tone, of a different character from either an open cylinder pipe or a stopped pipe. The pitch of the gemshorn is generally an 8-foot tone, sometimes it is a 4-foot or a 2-foot, and in the pedal organ a 16-foot.

GEMÜNDER, ge-mūn'dēr, AUGUST (1814-95). A naturalized American violin-maker, born at Ingelfingen, Württemberg. With his brother George (q.v.) he learned his trade under the famous Baptiste Vuillaume, of Paris, but in 1846 he settled at Springfield, Mass., and established himself in business there. He speedily earned an international reputation, and in 1860 moved his business to New York. Several famous violinists used his instruments; but perhaps his greatest masterpiece was the celebrated copy of Sarasate's Amati, which that artist pronounced equal to the original. He died in New York.

GEMÜNDER, GEORGE (1816-99). A brother of August Gemünder (q.v.), born at Ingelfingen. He worked at violin-making in Germany and France, followed August to the New World in 1847, and settled in New York in 1852. His instruments took the first prize at the great English Exhibition of 1851. In 1873 his copy of a Guarnerius was pronounced by the jury of awards at the Vienna Exhibition to be a genuine instrument. He claimed as the secret of his success that he did not use chemicals in the preparation of his wood, but instead used it in its natural condition. His instruments were even finer than his brother's, and were beyond question the best violins ever made in the United States. He was the author of a book entitled *George Gemünder's Progress in Violin-Making* (Astoria, N. Y., 1881). His death occurred in New York.

GENALA, jā-nā'lā, FRANCESCO (1843-93). An Italian legislator, born at Soresina, Province of Cremona. He took a conspicuous part in regulating the finances of the city of Florence, and in 1883 was appointed Minister of Public Works in the Depretis Cabinet, to which position he was reappointed, under Giolitti, in 1892. The leasing of the Italian railroads to three great corporations in 1885 was due chiefly to him.

GENAZZANO, jā'nāt-sā'nō. A town in the Sabine Mountains, in Central Italy, 27 miles east of Rome, famous for the Chapel of the Madonna del Buon Consiglio. It is visited by crowds of pilgrims. Population of commune, in 1901, 4121.

GENDARMES, zhān'dārm' (Fr., men at arms). From 1445 to the time of the French Revolution, the most distinguished cavalry corps in the service of the French kings, to whom they formed a sort of bodyguard. Under existing arrangements, the gendarmes constitute a military police, and comprise both cavalry and infantry. The force consists principally of soldiers

taken from the army, generally on account of intelligence and good conduct. The men receive much higher pay than the rest of the army, of which, however, the corps is a part, liable in cases of emergency to be sent on active service. The gendarmes amount to about 21,000 men, and are intrusted with the execution of many of the most delicate details of government. They form a national police, embracing all the departments and colonies of France. In war they are employed for the maintenance of order in camp and on the march. Germany and Russia likewise possess a force of similar nature, combining the functions of soldier and national police officer. These are mostly employed on patrol duty in rural districts and on the border.

GENDER (OF. *gendre*, *genre*, Fr. *genre*, from Lat. *genus*, race, from *gignere*, to beget, Gk. *γίγνεται*, *gignesthai*, Skt. *jan*, to be born). A grammatical category, commonly regarded as indicating the sex of a noun. Gender is either grammatical or natural. In the former case there is no necessary coincidence of sex and gender. Thus Latin *femina*, woman, is both naturally and grammatically feminine, but Latin *mensa*, table, is naturally sexless and grammatically feminine. In natural gender, on the other hand, sex and gender must agree, as in English *man* (masculine), *woman* (feminine), *thing* (neuter). In the Indo-Germanic languages (q.v.) the inflectional group, as Greek, Russian, or German, have grammatical gender, while the analytic group, as English or Persian, have only natural gender, except in a few apparent instances, as English *ship*. Gender in all Indo-Germanic tongues is divided into three classes, masculine, feminine, and neuter. It was long supposed, according to a theory promulgated by Jakob Grimm (q.v.), that grammatical gender depended upon personification; that, in other words, a noun had sex ascribed to it on account of some attribute either real or fancied. Thus Latin *sol*, sun, was masculine because of its burning rays and the energy which it imparts to all human activity; *luna*, moon, was feminine as being gentle and calmly beneficent; *mare*, sea, was neuter from its obvious sexlessness. The faults of this theory in a wider study of language, for instance, the fact that *Sonne*, sun, is feminine in German, while *Mond*, moon, is masculine, led to a rejection of Grimm's theory, and the substitution of entirely new hypotheses. A study of gender, however, as of all primary linguistic categories, is incomplete if the Indo-Germanic languages alone are considered. Natural gender, the application of which is too obvious to require exemplification, is found in practically all languages, even the most primitive, many of which have no grammatical gender, as in Dinka Negro (*tine džonkor*, female horse, *muor adžid*, bull fowl), Melanesian and Polynesian (as in the dialect of the island of Viti, *a toa tainang*, of fowl male, *a toa alewa*, of fowl female), or Annamese (*kon-trai*, son-child, *kon-gai*, daughter-child). Other languages have a division into animate and inanimate, as Algonquin, Iroquois, and Cherokee, or the Dravidian high-caste and low-caste genders. More elaborate schemes are also found, as in certain languages of the North Caucasian group, which have six genders—for animate and inanimate, rational and irrational, masculine and feminine. (See GEOR-

GIAN OR IBERIAN LANGUAGE.) It seems safe, therefore, to conclude, on such analogies as these, that the most primitive form of the Pre-Indo-Germanic languages also had a natural rather than a grammatical gender. The question then arises as to the origin of grammatical gender. This problem, one of the most difficult of all those presented by linguistic science, has been answered in several ways; and all theories concerning it must be regarded, in the present state of linguistic knowledge, as merely tentative. Of the two most plausible, the first is the one defended by Brugmann (q.v.). The masculine-neuter must be set over against the feminine. In this all scholars of prominence are agreed. It is then to be noted that the nominative plural neuter and the so-called nominative singular feminine are identical in their termination, as Vedic Sanskrit *yugā*, yokes (Classical Sanskrit *yugani*), and *sēnā*, army (compare, with shortened final syllable, Greek *δῶρα*, gifts, with *χώρα*, land; Latin *oppida*, towns, with *animā*, soul, while Oscan and Old Church Slavic retain representatives of original *-ā* in the neuter plural, as Oscan *prūftū*, things proved, beside *viū*, way, and Old Church Slavic *roucha*, garments, beside *noga*, foot). Again, in Greek and Avesta a neuter plural subject takes a singular root, as *rā olkhuara ērezer*, the buildings fell, *yā varasaitē*, what things shall be done. In view of facts like these, the feminine singular is regarded as a collective, originally identical with the neuter plural. This has an interesting and suggestive analogue in Arabic, where the so-called broken plural, which is preeminently a collective word, takes its verb in the feminine singular, as *jā'a rajulun*, there came a man, but *jā'at riḡalun*, there came men. The termination of the broken plural is also often identical with that of the feminine singular, as *ikhwatun*, brothers, from *akhun*, brother (cf. *malikatum*, queen, from *malikun*, king). This theory, however, is not altogether adequate, and it has been supplemented by such scholars as Wheeler and Jacobi. They have pointed out the influence of the pronoun, whose declension was perhaps once entirely unrelated to that of the noun, upon the noun. Here the origin of grammatical gender seems to lie. It is true that the feminine singular was originally a collective noun, merely differentiated in meaning from the neuter plural, and that it was occasionally concretized to denote a female being, as in the case of the Greek *γυνή*, woman, Beotian *βάρη*, Sanskrit *gnā* (originally 'bearings' in the discrete, then 'bearing' in the abstract, finally 'she who bears' in the concrete). From such instances many words in *-ā* were termed feminine by analogy (q.v.). On the other hand, the pronoun in all languages expresses natural, not grammatical, gender, denoting male, female, and sexless. The feminine singular of the pronoun may have terminated originally in *-ā*, like its neuter plural, but independently of it, differing herein from the noun, as already stated. On account of the true feminine termination of the pronoun, the collective noun, which chanced to coincide with it in form, was regarded as feminine, and by analogical extension a numerous class of 'feminines,' some female and others sexless, was evolved. In this way the so-called feminine gender probably arose. The so-called masculine gender was similar in development. The neuter originally dif-

ferred from the masculine only in the nominative singular (as Latin *servus*, *servum*, slave, but *templum*, *templum*, temple), and its plural, except for the collective form in *-a* (the so-called nominative and accusative, as *templa*, temples), was merely an extension analogical with the masculine. The neuter seems to have been a passive noun, while the masculine was active, and it was thus originally identical with the so-called accusative or objective case (cf. Latin *servus currit*, the slave runs, but *servum cædit*, he kills the slave, with *templum cadit*, the temple falls, and *templum eruit*, he pulls down the temple). The principle of personification, on which Grimm laid such emphasis, was developed after, not before, grammatical gender. The original independence of natural gender is seen from the so-called epicene nouns, which have but one grammatical gender for both natural ones, as Latin *lepus*, hare (masculine), *vulpes*, fox (feminine), German *Hase*, hare (masculine), *Mause*, mouse (feminine), which leads to such apparent incongruities as *vulpes mascula*, male fox, *weiblicher Hase*, female hare. With the decay of the inflection grammatical gender is gradually disappearing, and the more primitive system of natural gender, so long superseded, is resuming its original position, so that the classification of nouns as masculine, feminine, or neuter is being based more and more on sex, and not gender.

In English, where grammatical gender does not exist, natural gender is indicated in three ways. The first and most common method is by distinctive terminations for the feminine, especially by *-ess* (of Romance origin), as *emperor*, *empress*; *lion*, *lioness*; and also by *-ix* (of Latin origin), as *executor*, *executrix*; *-ine* (of Latin-Romance origin, primarily an adjectival formation of relation, as Latin *regina*, queen, literally kingly woman), as *hero*, *heroine*; and other more sporadic terminations. The second method is by prefixing words denoting the sex, as *he-goat*, *she-goat*; *man servant*, *maid servant*, etc. The third method is the use of different words for the two sexes, as *king*, *queen*; *boy*, *girl*; *stag*, *hind*, and the like.

Consult: Delbrück, *Vergleichende Syntax der indogermanischen Sprachen*, i. (Strassburg, 1893); Brugmann, *Nature and Origin of the Noun Genders in the Indo-European Languages* (New York, 1897); Jacobi, *Compositum und Nebensatz* (Bonn, 1897); Wheeler, "Origin of Grammatical Gender," in *Journal of Germanic Philology*, ii. (Bloomington, Ind., 1898); Paul, *Prinzipien der Sprachgeschichte* (3d ed., Halle, 1898).

In the highly inflected languages, there are certain terminations distinctive of the different genders. It is probable, indeed, that originally every noun, substantive or adjective, had a suffix indicative of the sex, real or imaginary, of the object designated, although, like other inflections (q.v.), these suffixes of gender were in process of time mutilated beyond recognition, or in many cases altogether worn off. The terminations most characteristic of the three genders in Latin are masc. *us*; fem. *a*; neut. *um*; corresponding to the Greek *os*, *ē*, *on*. In a great majority of the adjectives in both those languages, the genders are thus marked. In English the gender of a noun affects only the personal pronoun substituted for it; in most other languages the ad-

jectives (including the articles) have different forms for the several genders—a useless complication, in the case of modern languages at least. See ADJECTIVE.

Of the terminations distinctive of gender observable in modern English, some are purely Latin, as in *executor*, *executrix*; the feminine *-ess*, as in *countess*, is borrowed from the French, and is also of classical origin. The prevalent feminine termination in German is *-in*, as in *Tänzerin*, a female dancer (Fr. *danseuse*); of this there are two instances in English, in the provincial *carlin*, the fem. of *carl*, and *vixen* = Ger. *Füchsin*, a female fox. This affix was already in use in Latin, as in *regina*, a queen (*reg(s)*, a king); and in this form it is used in Europe generally to feminize proper names; e.g. *Georgina*, *Wilhelmina*, *Caroline*.

In such pairs as *son—daughter*; *man—maid*; *horse—mare*; *cock—hen*, there is no etymological relation between the words; they are from distinct roots. But with regard to *hen*, e.g. the Anglo-Saxon had the two forms, *han* for the male, and *hen* for the female; and *mare* was originally applicable to both sexes, as *horse* still is (Fr. *maréchal*, originally an officer who had charge of the horses). The oldest known form of the Teutonic speech, the Gothic, had the two words *magus*, son, and *magaths*, daughter, both from the root *mag*, to beget, or to make. *Magaths* has become in Ger. *Magd*, in Eng. *maid*; *magus* has been lost in the Teutonic tongues, but it is represented by the Celtic *mac* (son), evidently from the same root. *King*, *queen*, were in Sans. *ganika*, father, and *goni*, mother, both from the root *gan*, to generate, produce. The masculine form appears in O. Ger. as *chunig*, in modern Ger. *könig*, in Eng. *king*; the feminine was represented by the Greek *γυνή*, a woman, as well as the Saxon *cwen*, Sw. *quinna*, Old Eng. *quene* or *quean* applied to a woman generally, and the modern *qucen*, the chief woman of the land. See GRAMMAR.

GENDRON, zhān'drōn', AUGUSTE (1818-81). A French painter, born in Paris. He was a pupil of Delaroche, and also studied in Italy. His most popular works are "The Nereids" and "The Willis," both fairy scenes depicted with much grace and action. They are frequently engraved. Less popular, but technically as good, are "Sunday at Florence in the Fifteenth Century" and "The Foolish Virgins." He also painted some decorations in the Louvre.

GENEALOGY (Lat. *genealogia*, Gk. *γενεαλογία*, pedigree, from *γενεαλόγος*, *genealogos*, one who draws up a pedigree, from *γενεά*, *genea*, family + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The science whereby the history of the origin and descent of a family or race may be ascertained. In recent years there has been a growing interest, especially in the United States, in matters pertaining to genealogical research, and although in itself it is not of sufficient importance to rank as an independent science, it forms a very important part of history. For the popular mind it has but small attraction, its literature being for the most part shut up in the archives of historical libraries, but that natural instinct which prompts one to love the place of his birth and the chief circumstances in the lives of his progenitors is gradually attracting the attention of the intelligent public.

From the earliest times, genealogy has always formed the basis of all true history. In the ancient records of Assyria, Egypt, and Arabia, the lineage of an individual was the thread upon which were strung the stirring events of centuries, and so important a place did its preservation occupy among the Jewish people that it was established as a positive obligation upon every Levite of the Temple. Nor was this genealogical form of history peculiar to Semitic races. The first Greek records were those of ancestry. The progress of civilization in States, and in particular the institution of corporations and guilds in the towns, afforded a wider scope for genealogy. But the absence of criticism and the desire to flatter the great were the causes of introducing the most ridiculous fables into genealogy. Ancestors were fabricated in the most impudently false manner, and families carried back in an unbroken line, not only to the age of Charlemagne, but even, in many cases, to the heroes of the Trojan War. The fact, however, is, that scarcely any family, however distinguished, can trace its ancestors even to the middle of the eleventh century.

GENÉE, zhe-ná', RICHARD (1823-95). A German opera composer and librettist, born at Danzig. Upon abandoning medicine for music, he became a pupil of Stahlknecht, in Berlin. He held many important appointments, principally as orchestra leader, in the following towns and cities: Riga, Reval, Cologne, Aix-la-Chapelle, Danzig, Düsseldorf, Mainz, Schwerin, Amsterdam, Prague, and Vienna. His operettas had considerable local success, but are little known abroad. They are as follows: *Der Geiger von Tirol* (1857); *Der Musikfeind*, *Die Generalprobe*, *Rosina*, *Am Runenstein* (1868); *Der Seekadett* (1876); *Der schwarze Prinz*, *Im Wunderlande der Pyramiden*, *Die letzten Mohikaner*, *Die Piraten*, *Nisida*, *Zwillinge*, *Die Dreizehn* (1887). He also wrote some of his own librettos, and others for Millöcker, Strauss, and Suppé. His death occurred at Baden, near Vienna.

GENÉE, RUDOLF (1824—). A German author and Shakespearean reader. He was born in Berlin, a son of Richard Genée, formerly stage-manager of the Königsstädtisches Theatre in that city. He at first devoted himself to wood-carving under Professor Gubitz, but later wrote several successful plays, of which the comedy entitled *Das Wunder*, performed at the Court Theatre, Berlin, in 1854, was particularly successful. For a time, as editor of the *Danziger Zeitung* and of the *Coburger Zeitung* (1861-64), he published his *Frauenkranz*, a series of readings on dramatic female figures in history. It was at Coburg that he began his public readings of Shakespeare, which he continued with marked success at Berlin, Dresden, Vienna, and other cities of Germany. His principal literary productions include: *Geschichte der Shakespeare'schen Dramen in Deutschland* (1870); *Shakespeares Leben und Werke* (2d ed. 1874); *Hundert Jahre des königlichen Schauspiels in Berlin* (1886); *Marienburg*, a novel (2d ed. 1886); *Bismarckjade* (1891); and *Zeiten und Menschen* (1897).

GENELLI, jâ-nel'le, BONAVENTURA (1798-1868). A German painter and designer, born in Berlin. He was the son of Janus Genelli, a

landscape painter. Bonaventura was a painter of biblical and mythological subjects, but more celebrated for his ingenious designs. He had the imagination of a poet, but in working rarely soared beyond contour and silhouettes. Everything was sacrificed to line. He essayed much in water-color and oil, but failed to express himself with success in those mediums. He was a pupil of the Berlin Academy, and also spent ten years in Rome, where he was especially influenced by Carstens, and also by Thorwaldsen. In 1836 he settled at Munich, where he lived in poverty, but executed his principal works. In 1859 he removed to Weimar, by invitation of the Grand Duke. Here his material cares ended, but also his important work. Among his best designs are the copper prints of the "Life of a Profligate" and the "Witch." In the Leipzig Museum is his water-color "Triumph of Bacchus and Ariadne." Among his numerous works are: "Jason and Medea Stealing the Golden Fleece;" "Hercules Playing the Lyre;" "Joseph and Potiphar's Wife;" "Abraham and the Angels." He died in Weimar. Consult: Pecht, *Deutsche Künstler des 19. Jahrhunderts* (2d series, Nördlingen, 1879); Muther, *History of Modern Painting* (London, 1896).

GENERAL (Lat. *generalis*, general, belonging to a race, from *genus*, family, from *gignere*, to beget). A military rank and title denoting an officer holding a general command, or a rank and grade equivalent thereto. In modern armies, practically every officer commanding an organization of troops larger than a regiment is a general officer. In the United States, the rank has the following grades: brigadier-general, major-general, and one lieutenant-general in supreme active command of the army as a whole. Officers of other ranks are sometimes given the temporary and relative rank of general, as inspector-general, judge advocate-general, quartermaster-general, etc. In European armies the rank of general is a step higher than that of lieutenant-general, and is the next in importance to field-marshal in England, and to marshal in the armies of Continental Europe. See RANK AND COMMAND.

The title is also applied in the Roman Catholic Church to the superior head, under the Pope, of a religious order. The governing authorities of the monastic orders may be arranged in three classes: (1) The superiors of individual convents or communities, called in different orders by the various names of abbot, prior, rector, guardian, etc.; (2) the provincials, who have authority over all the convents of an entire province, the provinces, in the monastic sense of the word, being usually coincident as to local limits with the several kingdoms in which the order is established; (3) the general, to whom not only each member of the order, but all the various officials of every rank, are absolutely subject. The general is usually elected by the general chapter of the order, which, in the majority of orders, consists properly of the provincials; with whom, however, are commonly associated the heads of the more important monasteries, as also the superiors of certain subdivisions of provinces. The office of general in most orders is held for three years. In that of the Jesuits it is for life: but in all, the election of the general chapter must be confirmed by the Pope. In most orders,

too, there is assigned to the general a consultor (*admonitor*) or associate (*socius*), who, however, is only entitled to advise, and has no authority to control the superior. The general also is supposed to consult with and to receive reports from the various local superiors. He sends, if necessary, a visitor to inquire into particular abuses, or to report upon such controversies as may arise, and he holds a general chapter of the order at stated times, which differ according to the usage of the several orders. The general is exempt from episcopal jurisdiction, being subject to the immediate jurisdiction of the Pope. He lives in Rome, where he has certain privileges, the most important being the right to sit and vote with the bishops in a general Church council.

GENERAL ASSEMBLY. See PRESBYTERIANISM.

GENERAL AVERAGE. See AVERAGE, IN MARITIME LAW.

GENERAL BAPTISTS. See BAPTISTS.

GENERAL CONFERENCE MENNONITES. See MENNONITES.

GENERALIFE, HÀ-NÀ-RÁ-L'É-FÁ (Ar. *jannat-al-drif*, Garden of the Architect). A summer palace of the Moorish kings, at Granada, east of the Alhambra, now the property of the Marquis of Campotejar. The extensive grounds are traversed by the waters of the Darro. The court contains cypresses dating from the thirteenth century, and communicates with a raised garden and belvedere, which affords an extensive view.

GENERAL ISSUE. In the English law of pleading, the form in which the defendant traverses or meets with a simple denial the whole allegation, or the principal fact on which the plaintiff relies in his declaration. Thus, in actions founded on wrongs the general issue is 'not guilty'; in actions of debt, that the defendant never was indebted; in actions on a deed or bond, *non est factum*, i.e. it is not the deed of the defendant. Under this issue, the defendant may prove that he never executed the deed, but not that it is bad in point of law.

In *criminal proceedings* the general issue is 'not guilty,' by which plea, without further form, every person not having the privilege of peerage, upon being arraigned upon any indictment for treason, felony, or piracy, is deemed to have put himself upon the country for trial. Where a prisoner refuses to plead, a plea of not guilty may be entered for him, 7 and 8 Geo. IV., c. 28. Under the plea of not guilty, the prisoner is entitled to give in evidence not only everything which negatives the charge, but also all matter of excuse or justification.

This form of plea survives and retains its principal characteristics even under the reformed systems of pleading which, in England and many of the United States, have supplanted the common-law system. See PLEA; PLEADING.

GENERALIZATION. See INDUCTION.

GENERAL LIEN. See LIEN, GENERAL.

GENERAL PAUSE. In music, a pause for all instruments or parts during a composition. The name is especially applied to rests of considerable duration, when so introduced as to break the rhythm and produce a striking effect. A 'hold' \odot over the rest-mark of a general pause indicates that its length is indeterminate,

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and so destroys the rhythmic value of the rest by suspending the counts or beats. See HOLD.

GENERAL SERVICE AND STAFF COLLEGE. A military school for the further technical and professional education of military officers of the United States Army, situated at Fort Leavenworth, Kan. Subsequent to the declaration of war with Spain in 1898, there were appointed in the line of the army 1542 lieutenants, in addition to those appointed from the Military Academy. Of this number 616 had previously served as officers of volunteers; 414 were appointed from the ranks of the regular and volunteer regiments; and 512 were appointed from civil life. At the conclusion of hostilities Congress made provision for the reopening of the army schools for commissioned officers, which had of necessity been closed during the war, and at the same time enlarged and developed the Fort Leavenworth School into a general service and staff college. Every effort was put forth to bring the standard of technical and professional proficiency of the officers above mentioned up to that of the West Point graduate. The staff of the college detailed to assist the commandant, who is also the commanding officer of the post of Fort Leavenworth, consists of an assistant commandant, and the instructors in charge of departments. The instructors are detailed by the War Department, and there are four departments—tactics, engineering, military law, military sanitation and hygiene. The course of instruction covers one year of two terms, the first term beginning on the 1st of September, unless that date fall on Saturday or Sunday, in which case the course begins on the following Monday. It ends on the 21st of December, concluding with the semi-annual examinations. The second term embraces the period from the 4th of January to the 30th of June following, concluding with the final examinations. The students are all graded in one class, which is divided into sections of convenient size and adaptation. The staff of the college note the names of students who have shown marked proficiency in any branch, with a view to the student's professional employment in that particular branch. See MILITARY EDUCATION.

GENERAL SHIP. A ship which has been advertised by the owners to take goods from a particular port at a particular time, and which is not under any special contract to particular merchants. The owners, in this case, engage separately with each merchant who applies to them to convey his goods to the ship's destination. The contract between the owners, or the master acting in their behalf, and the proprietors of the goods, may in the case of general ship be established by parole evidence, and, indeed, there is rarely any other writing on the subject beyond the advertisement and the bill of lading. In a general ship, the master being intrusted by the owners with full power to contract for and take in goods, no agreement for freight which any one may have made with the owners, independently of him, will be effectual to secure room in the vessel. All such agreements must be intimated to the master, or those acting for him on board, before he has engaged freight for the whole vessel. By such intimation, a preference will be secured over the merchant who brings his goods to the ship's side on chance. If the owners of a

general ship have advertised her as bound for a particular port, they must give specific notice to every person who may ship goods on board of any alteration in her destination, and they will be liable for the consequences of neglecting to do so.

GENERAL STAFF. An organization of superior or selected officers, appointed to the staff of a general officer commanding, whose duties may be generally described as converting the ideas of their chief into orders, not only by conveying them to the troops, but by working out all necessary matters of detail. The general staff organization was originally peculiar to Germany, but is now being generally adopted throughout Continental Europe. The great general staff, *Grosser Generalstab*, as distinct from *Generalstab*, in the German Army of to-day, is a body of general staff officers who are not attached to any corps, intrusted with the duties of drawing up and preparing schemes for the strategical concentration of the army in certain particular directions by road and rail, with collecting and estimating the strength, etc., of the various European armies, with the study of theatres of war, and with the preparation of military maps. The work of the greater general staff is done under the immediate supervision of the chief of the general staff. See **STAFF**; and **ARMY ORGANIZATION**.

GENERAL THEOLOGICAL SEMINARY.

The leading seminary in the United States of the Protestant Episcopal Church. The seminary was established by order of the General Convention in 1817, and instruction was begun in New York City in 1819. In 1820 the seminary was removed to New Haven, but was reestablished in New York in 1822 on a part of the plot of land given in 1819 by Clement C. Moore. That land now forms the entire area between Twentieth and Twenty-first streets, Ninth Avenue and the North River. For many years the seminary suffered severely from financial deficiencies, and it was not until the administration of Eugene A. Hoffman, dean of the school from 1878 until his death in 1902, that it was placed upon an independent basis. Dean Hoffman's gifts alone amounted to \$1,000,000 or over, while in 1902 the total resources of the seminary were not less than \$4,000,000. The theological course proper extends over three years, and there is also a post-graduate course. The degrees of D.D. and B.D. are conferred; the former is both a higher academic and an honorary degree, while the latter is usually conferred in course on students holding prior academic degrees, who have completed the regular course in high standing. The control of the seminary is vested in a board of trustees composed of the bishops of the Church, twenty-five members elected by the General Convention, and certain other members elected by the various dioceses, principally that of New York. The student attendance is approximately 150. No tuition fee is charged, and many prizes of value are offered. Within twenty-five years the student body has largely increased, and extensive buildings have been erected, including the library, Hoffman Hall, the Chapel of the Good Shepherd, and nine dormitories.

GENERATION. See **REPRODUCTION**.

GENERATION (Lat. *generatio*, from *generare*, to beget, from *genus*, family). In mathematics, the formation of a magnitude or geometric figure by the movement of another magnitude or figure. E.g. a moving point describes a line; a moving line, in general, describes a surface; and a moving surface, in general, describes a geometric solid. An angle is said to be generated by revolving a line about a fixed point from an initial position. A figure called the generatrix, moving according to a fixed law, generates a particular figure called the generant; e.g. a straight line moving so as constantly to pass through a given curve, and to remain parallel to its original position, generates a cylindrical surface. The given curve is called the directrix. The volume of a ring generated by revolving a polygon about an axis not cutting the polygon is equal to the area of the polygon multiplied by the length of the path of the mean centre of the polygon. This proposition is known as Pappus's or Guldin's theorem.

GENERATION, ETERNAL. See **TRINITY, DOCTRINE OF THE**.

GENERATIONS, ALTERNATION OF. See **ALTERNATION OF GENERATIONS**.

GENERATIVE CELL. A very general term, but technically applied in seed-plants to the first cell which appears in the sperm series. In gymnosperms (pines and their allies) it is the cell which divides to form the stalk and body cells, the latter of which subsequently divides to form the male cells. In angiosperms (true flowering plants) it is a cell which is formed by the first division of the nucleus of the pollen-grain, and in turn by division immediately forms the male cells. See **SPERMATOPHYTE**.

GENERATRIX. See **GENERATION**.

GENESEE (jĕn'e-sĕ') RIVER (American Indian, pleasant valley). A stream rising in Potter County, Pa., and flowing northwest through New York, emptying into Lake Ontario, seven miles north of Rochester (Map: New York, C 2). It is about 135 miles long, courses through a very beautiful region, and is navigable for five miles by lake vessels. Near Portage it passes over three falls respectively 65, 90, and 110 feet high, furnishing great water-power; and in the city of Rochester there is a perpendicular fall of nearly 100 feet.

GENESEE SHALE. See **DEVONIAN SYSTEM**.

GEN'ESE'O. A village and the county-seat of Livingston County, N. Y., 30 miles south of Rochester, on the Genesee River, and on the Erie Railroad (Map: New York, C 3). It is the seat of a State normal school, and has the Wadsworth Public Library with about 13,000 volumes and an interesting collection of curios belonging to the County Historical Society. The village is in an agricultural region, and manufactures flour, gloves and mittens, machine-shop products, lumber, etc. Population, in 1890, 2286; in 1900, 2400.

GENESIS (Lat., from Gk. *γενεσις*, *genesis*, origin, from *γενεσθαι*, *gignesthai*, to become), **BOOK OF**, or more fully **GENESIS KOSMOU** (Gk. *γενεσις κόσμου*, origin, generation of the world). The name given by the Septuagint to the opening book of the Bible. In the Hebrew canon it is called *B'reshith* ('in beginning'), from the

initial word; in the Talmud it is sometimes referred to as 'the Book of Creation,' or 'the Book of Abraham, Isaac, and Jacob.' Its Masoretic division into 50 chapters, followed in the English Bible, or into 12 large and 43 small encyclical sections (*sedarim parashioth*), does not correspond to any logical division of the subject matter. The book seems of itself to fall most naturally into two totally distinct parts. The first extends from the beginning to the call of Abraham (chs. i.-xi.), and embraces the account of the creation; the fall; the generations between Adam and Noah, together with their religion, arts, settlements, and genealogy; the Deluge; the re-peopling of the earth; the Tower of Babel; the dispersion of the human race; and the generations between Noah and Abraham, thus forming an introduction to the second part (chs. xii.-l.), or the history of the patriarchs (Abraham, Lot, Ishmael, Isaac, Jacob, Esau, and Joseph), the whole concluding with the settlement of Jacob's family in Egypt. Another division seems indicated by the inscription *Toledoth* (origins, generations), which occurs ten times in the course of the book, introducing at each repetition a new cycle of the narrative, and which would thus split the whole (from ii. 4) into ten distinct sections of disproportionate length.

While the Jewish canon makes Genesis the first of a series of five books, which it comprises under the term *Torah* ('law'), according to the modern critical view Genesis is part of a comprehensive Hebrew history, beginning with creation and extending to the destruction of Jerusalem by Nebuchadnezzar, and comprising, therefore, besides the Pentateuch, the four books of Joshua, Judges, Samuel, and Kings. The book of Genesis, like the other books of the series, is held to be of a composite character. There are two great compilations underlying it, the one—the priestly history—forming a setting to the priestly code (see PENTATEUCH); the other a purely historical compilation, written, however, from the point of view of the prophets and commonly designated as JE. (See ELOHIST AND YAHWIST.) Of these, the latter, which again represents a combination of two documents—a Yahwistic and an Elohistic history—is the older, being the work of a Judean in the seventh century B.C., whereas the priestly history is post-exilic. In the combination of these two works, additions and changes have been introduced by a series of redactors, which, however, do not efface the independent character of each. The older combination JE is characterized by what may be called its popular character. The old stories and legends are charmingly told, and while the prophetic point of view is never absent, there is considerable interest felt in the stories as such. The priestly history, on the other hand, shows throughout the result of study and most decided theological and scholastic proclivities. The creation narrative is told as an illustration of the dogma of ethical monotheism, and the goal of God's work in creating the world is the establishment of the Sabbath as a day of rest; and so throughout, everything hinges upon the ritual, and the stories are made to lead up in some way to some definite point of the divine law.

This modern theory as to the composition of Genesis satisfactorily disposes of the difficulties which the old exegesis encountered. It explains the frequent double versions of one and the same

tale, the numerous inconsistencies in the statements found in the book itself, as well as the traces of events, such as the establishment of the kingdom, the erection of the Temple at Jerusalem, and even the Exile, which belong many centuries subsequent to the days of Moses, who became in tradition the author of the entire Pentateuch.

BIBLIOGRAPHY. Of the numerous commentaries on Genesis, those of Gunkel, Holzinger, Dillmann, Delitzsch, Ball, and Strack are to be recommended, as well as the introductions to the Old Testament by Kuenen, Driver, Cornill, Bleek-Wellhausen. Consult, also: Kalisch, *Commentary of Genesis* (London, 1859); Dods, *The Book of Genesis* (New York, 1888); Candlish, *The Book of Genesis* (London, 1884); Halévy, *Recherches bibliques* (Paris, 1895); Spurrell, *Notes on the Text of the Book of Genesis* (Oxford, 1896); Bacon, *The Genesis of Genesis* (New York, 1892); Fripp, *The Composition of the Book of Genesis* (London, 1892); Schurmann, *Die Wellhausensche Pentateuchtheorie dargestellt und geprüft* (Karlsruhe, 1892); Green, *The Unity of the Book of Genesis* (New York, 1896). For the meaning of the stories included in Genesis, see CREATION; ADAM; EVE; CAIN; ABEL; BABEL, TOWER OF; EDEN; DELUGE; NOAH; ABRAHAM; ISAAC; JACOB; JOSEPH.

GENET, jèn'èt, or **GENETTE** (Fr. *genette*, from Sp. *gineta*, from Ar. *jarnait*, genet). One of several species of small animals forming the genus *Genetta* of the family Viverridæ, and nearly allied to the true civets (q.v.), but having only a rudimentary odoriferous pouch, and claws perfectly retractile, as in the cats. The approximation to that family also appears in the vertical contraction of the pupil of the eye. The species are numerous; smaller and more slender animals than the civets, mostly natives of Africa and Southwestern Asia. One, the common genet (*Genetta vulgaris*), is found in the south of Europe, Western Asia, and Northern Africa. It is gray, with small round or oblong black or brown spots; the tail, which is as long as the body, ringed with black and white. It frequents the banks of brooks. Its fur is a considerable article of commerce. It is easily domesticated, and is kept in houses in Constantinople to catch mice. Of the other species two are South and East African, and one is restricted to West Central Africa.

The genet is sometimes met with in heraldry. There was an order of knighthood in France, which was said to have been founded by Charles Martel, called the Order of the Genet, but it has long ceased to exist.

GENET, or **GENEST**, zhá'ná', EDMOND CHARLES EDOUARD (1765-1834). A French diplomat, born at Versailles. His father was the chief of the Bureau of Correspondence of the Department of Foreign Affairs, and the youth, with the rank of captain of dragoons, was attached to the Bureau as interpreter in 1775. He early developed remarkable powers as a linguist, and at the age of twelve translated from the Swedish into French the *Histoire d'Eric XIV., roi de Suède* (1777), and *Recherches sur l'ancien peuple finnois* (1778). In 1779 and 1780 he was successively attached to the French embassies at Berlin and Vienna, and in 1781 succeeded his father in the Department of Foreign Affairs, which position he retained until 1788. In 1788 he accom-

panied the Comte de Ségur to Saint Petersburg, as secretary of the French Embassy, remaining in charge after Ségur's retirement until 1792, when he was given his passports at the demand of the Empress Catharine II. In Paris Genet allied himself to the Girondists, and in November, 1792, was named Ambassador to Holland, whence he was transferred in the following spring as 'Minister Plenipotentiary to the Congress of the United States.' His mission, it was expected, would induce the United States to declare war against Great Britain, and he came with the intention not only of accomplishing that purpose, but of raising a volunteer army to regain Louisiana from Spain and of commissioning privateers in American ports. He landed at Charleston, S. C., April 8, 1793. He was enthusiastically welcomed and fêted at Charleston and Philadelphia, and, encouraged by the expressions of sympathy and friendship for France which he heard on all sides, he immediately began to deal out commissions for privateers, and seek recruiting agents. Washington, however, by the unanimous advice of his Cabinet, had issued a proclamation of neutrality on April 22d, and on June 5th Jefferson, the Secretary of State, notified the French envoy that he must cease arming and equipping privateers in American ports. Genet replied that he was acting under the treaties of 1778, and continued to disregard Jefferson's warning. In the next few months eight privateers, commissioned by him, had, with the assistance of two French frigates, captured fifty British merchantmen, some of which had been taken within the jurisdiction of the United States. Genet asserted that these prizes could be condemned by French consuls in American ports, and demanded the right to enter the condemned goods duty free. His contention reached the height of absurdity when he declared that the United States Constitution did not give Washington the right to treat with him, and made the demand that an extra session of Congress be called for that purpose. These and subsequent imprudent criticisms and attacks upon Washington, and the continuance of his activities in fitting out privateers and raising recruits, lost him most of the allies he had at first possessed, and the arrest of two of his agents and the expulsion of the French consul at Boston were followed by a demand for his own recall, which was acceded to by the French Government in the following year. The fate of his fellow Girondists warned Genet not to return to France, and he became a naturalized American citizen, settling in New York, where he married a daughter of Governor George Clinton.

GENETHIALOGY (Gk. γενεθιαλογία, *genethialogia*, casting of nativities, from γενεθλή, *genethlē*, birthday, from γίγνεσθαι, *gignesthai*, to be born + -λογία, -logia, account, from λέγειν, *legein*, to say). A term sometimes used to describe astrology as used in calculating nativities or predicting future occurrences from the stars that preside at the birth of persons. See **ASTROLOGY**; **DIVINATION**.

GENETIC PSYCHOLOGY (from Gk. γένεσις *genesis*, origin, from γίγνεσθαι, *gignesthai*, to be born). Under this head are included all those branches of psychology which treat of the growth or development of mind, individual or social. Hence, like experimental psychology (q.v.), it is rather psychology as viewed from a particular

standpoint than a particular department of general psychology. It is customary to bracket together animal and child psychology (qq.v.) under the genetic heading; but while the child mind may be investigated as the immediate, and the animal mind as the more remote source of origin of the adult human mind, both the animal and the child may also be examined for themselves, without overt regard to their place in the evolutionary series. Ethnopsychology and social psychology, in the same way, may be treated either statically or genetically, though as a rule (especially in the discussion of the great mental products, myth, language, and custom) the genetic method is followed.

Modern science is so thoroughly dominated by the evolutionary idea that it may seem, at first thought, as if a scientific psychology must necessarily be genetic. And this is true, in the sense that the psychologist, in whatever field he may be working, must never forget the organic character of mind, the fact that our present consciousnesses are what they are by reason of the past history of mind as well as of current stimuli. Even when we attempt to analyze so apparently simple a process as perception, we are invariably referred to genesis for the explanation of certain of its features. At the same time, it would be impossible to-day to write a satisfactory genetic psychology, in the full meaning of the term. For (1) the most assured results of mental science lie in the domain of analysis, not of genesis. When we think of the development of mind, we think instinctively of the development of mental function. Now, a psychology of function tends to become a merely classificatory psychology (see **FACULTY**); and the writers who have escaped this tendency are not in agreement among themselves, some making will, and some feeling, and some an intellectual process, the root function of mind. It follows that the works on genetic psychology have a distinct personal flavor; it is as natural to speak of 'Spencer's psychology' as it is unnatural to speak of 'Kelvin's physics' or 'Liebig's chemistry.' Again, (2) while the belief is practically universal among psychologists that the human mind has grown out of the rudimentary consciousness of primitive organisms, it is still very difficult to envisage the course of development, to imagine what the primitive mind was and how—by what steps or stages, by what mechanism—it has developed. Some investigators (e.g. Romanes) write as if there were a simple superposition of function on function, faculty on faculty; others (e.g. Baldwin) give us rather a development of a motor than of a mental organism; others offer descriptions of special consciousnesses at various levels of development, without asking how the earlier become transformed and differentiated into the later.

A genetic psychology is, therefore, not so much an accomplished fact as the conscious and necessary ideal of psychological inquiry, itself the final term of a psychological development. As anatomy comes before physiology, so has the analysis of mental structure, furnished by experimental psychology, come before any accepted discrimination of mental functions.

Consult: Darwin, *Descent of Man* (New York, 1895); Baldwin, *Mental Development in the Child and the Race* (New York, 1895, 1897);

Spencer, *Psychology* (New York, 1881); Romanes, *Mental Evolution: Man* (London, 1885); id., *Mental Evolution: Animals* (London, 1888).

GENEVA. The southwesternmost canton of Switzerland, bounded by the Canton of Vaud and Lake Geneva on the north, and by France on the east, south, and west (Map: Switzerland, A 2). Area, 108 square miles. The surface consists of low hills, watered chiefly by the Rhône. The soil is not naturally fruitful, but the careful industry of the inhabitants has rendered over 80 per cent. of the total area of the canton productive. Grain, wine, fruits, and vegetables are produced in considerable quantities, and domestic animals are raised. Industrially Geneva is one of the leading cantons of Switzerland, and is famous for its watch-manufacturing industry, which was introduced from France as early as 1587. The manufacture of music-boxes and jewelry was begun later, and at present the products of the canton include machines, mathematical instruments, and electric apparatus. The silk industry, formerly of great importance, is now in a state of decline. The commerce is greatly facilitated by the proximity to France, and the products of Geneva, especially watches, are exported to all parts of the world.

The Constitution of the canton, first adopted in 1847, and repeatedly modified, provides for a true democratic form of government. The legislative power is vested in the *Grosser Rat*, consisting of 100 elected members; the executive power, in a Council of State of 7 elected members. The referendum was introduced in 1880. Besides a number of higher and inferior courts, Geneva has also arbitration courts for the settlement of industrial disputes. Population, in 1888, 105,509; in 1900, 132,000. The inhabitants are divided about equally between Roman Catholics and Protestants, about 30 per cent. being foreigners and nearly 90 per cent. speaking French. Capital, Geneva (q.v.).

GENEVA. The capital of the Swiss canton of the same name, situated at the southwestern extremity of the Lake of Geneva, at the outlet of the river Rhône, which divides the city into two equal parts (Map: Switzerland, A 2); latitude 46° 13' N., longitude 6° 10' E. It is magnificently situated, in full view of the Alps (including Mont Blanc) and the Jura. The old city, on the left bank of the river, constitutes the business and financial quarter, and is irregularly laid out, with steep, crooked streets, except for the portion along the river, which has fine quays and broad avenues. On this side of the river is the section of the city called Eaux Vives. Nine bridges span the Rhône, one of which rests upon an islet called Rousseau's Island. On the right bank is the Quarter of Saint Gervais, which is chiefly residential, containing a great part of the laboring population. Here are also hotels for the accommodation of foreigners, who form a considerable colony in Geneva. There are numerous squares, parks, and gardens, most of them in the old city. The most notable are the Jardin Anglais, or Promenade du Lac, along the lake shore, and the Place Neuve, with the Promenade des Bastions, leading southward to the botanical gardens. The most important square in the Saint Gervais Quarter is the Place des Alpes, with a magnificent memorial cenotaph of the Duke Charles II. of Bruns-

wick, who left his fortune of \$4,000,000 to the city. Boulevards laid out on the site of the ancient walls extend around the city. The principal buildings are the Romanesque Cathedral of Saint Peter, built in the eleventh century; the sixteenth-century town hall, with the house near by in which Rousseau was born; the university (see GENEVA, UNIVERSITY OF); the Musée Fol, with archaeological collections; and the Musée Rath, an immense art collection given by the Russian General Rath to the city. Also noteworthy are the Anglican and American Episcopal churches and the new theatre. Besides the university, Geneva has the Collège de Genève, founded by Calvin in 1559; various industrial, technical, and commercial schools; academies of art and music; and a deaf and dumb institute. There are many learned and art associations, notably the Natural Science Association, the Geographical Society, and the Society of Artists.

Geneva has long been known as a manufacturing city, and especially as a clock and watch making centre. The value of the annual output of that industry averages \$4,000,000, while the output in jewelry and gold and silver ornaments rises as high as \$3,000,000 yearly. Besides these industries, the most important are enameling, diamond-cutting, and the production of music-boxes and scientific instruments. The town enjoys a favorable position for trade with France and the Mediterranean shore, exporting its own manufactures and those of the surrounding districts. It is the residence of a United States consul. The town is a railroad centre, and is traversed by horse-car lines and steam suburban railroads. The municipality's progressiveness has been particularly marked since 1847 by radical improvements throughout the city. Breakwaters, protecting the lake harbor; hydraulic works in the Rhône, supplying the city with water and furnishing power for factories; gas, electric-lighting, and power plants; markets, savings banks, industrial schools, theatre, opera house—all have been municipalized. The fire brigade, however, remains a volunteer organization. Population, in 1888, 52,043; in 1900, after the incorporation of various suburbs, 105,710.

At the time of Cæsar's campaign against the Helvetii Geneva belonged to the country of the Allobroges. It was afterwards included in the Roman *Provincia Maxima Sequanorum*, and was a place of some importance under the Burgundian kings. In the year 536 it came under the rule of the Franks, and toward the close of the ninth century became part of the new Kingdom of Transjurane Burgundy. It had been made a bishop's seat in the fifth century, and from the twelfth century continual feuds arose between the bishops and the counts of Savoy with regard to supremacy. The citizens profited by these dissensions to obtain fresh liberties and privileges for themselves. In 1531 the Genevese renewed their alliance with Fribourg and Bern, and thus Geneva became a member of the Swiss Confederation. The doctrines of the Reformation, boldly and enthusiastically preached by Guillaume Farel, met with general acceptance in Geneva. In conjunction with Bern, the citizens expelled the adherents of the dukes of Savoy—the so-called Mamelukes—from the town, and declared the bishopric vacant. In August, 1535, the Reformed religion was established by law, and in 1541 Calvin was

invited to take up his residence permanently in Geneva as public teacher of theology. It was he who chiefly impressed the stamp of rigid morality, not unalloyed with pedantry, on the minds of the citizens of Geneva, and awakened a taste for the exact sciences. The town, which had hitherto been merely a place of trade, thus acquired an important influence over the spiritual life of Europe, and became the centre of education for the Protestant youth of Great Britain, France, Germany, and Spain. In 1602 the last attempt of the dukes of Savoy to recover the town was frustrated by the energy and resolution of the citizens. During the eighteenth century Geneva was distracted by a continued feud between the aristocratic and popular parties, until in 1782 Bern, Sardinia, and, in particular, France interfered in favor of the aristocracy. The French Revolution led to a new crisis; the Government was overthrown in July, 1794, equality in the eye of the law was established, a National Convention appointed, and a Reign of Terror commenced. In 1798 Geneva with its territory was annexed to France, under the name of the Département du Léman. After the overthrow of Napoleon Geneva recovered its independence, and the Congress of Vienna increased its territory considerably. From 1841 to 1878 its history was one of political struggles between clerical, conservative, radical, and independent factions, which resulted in the separation of Church and State and the triumph of the progressive parties. Consult: Pictet de Serigny, *Genève, origine, etc.* (Geneva, 1843-47), and *Genève ressuscitée* (Geneva, 1869); Cherbuliez, *Genève, ses institutions, etc.* (Geneva, 1868); Galiffe, *Genève historique et archéologique* (Geneva, 1869); Blavignac, *Etudes sur Genève* (Geneva, 1872-74).

GENEVA. A city and the county-seat of Kane County, Ill., 35 miles west of Chicago; on the Fox River, and on the Chicago and Northwestern and the Chicago, Burlington and Quincy railroads (Map: Illinois, D 2). It is popular as a residential place for Chicago business men, has a public library and one of the finest court-houses in Illinois, and is the seat of the State Reformatory for Female Juvenile Offenders. There are manufactures of glucose, windmills, sadirons, boxes, flour, etc. Settled about 1833, Geneva was incorporated in 1835 as a village, and as a city in 1887. The water-works and electric-light plant are owned and operated by the municipality. Population, in 1890, 1692; in 1900, 2446.

GENEVA. A city and the county-seat of Fillmore County, Neb., 60 miles west by south of Lincoln; on the Burlington and Missouri River and the Fremont, Elkhorn and Missouri Valley railroads (Map: Nebraska, G 3). It is the seat of the State Industrial School for Girls. The principal industries are farming and stock-raising. Population, in 1890, 1580; in 1900, 1534.

GENEVA. A city in Ontario County, N. Y., 52 miles southeast of Rochester; on Seneca Lake, the Seneca and Cayuga Canal, and the New York Central, the Lehigh Valley, and other railroads (Map: New York, C 3). It commands a magnificent view of the lake and surrounding country, and is the seat of Hobart College (Protestant Episcopal), opened in 1822, and of the State Agricultural Experiment Station. The

city is noted for its extensive nurseries, and has manufactures of stoves, steam boilers, optical supplies, cereals, canned goods, etc. Geneva was chartered as a city in 1898, and is governed by a mayor, chosen every two years, who controls appointments to most of the municipal offices, and a unicameral council. The city owns and operates its water-works. Near Geneva stood the Indian village, Kanadesaga, destroyed by Gen. James Clinton in 1779. Population, in 1890, 7557; in 1900, 10,433.

GENEVA (from OF. *genevre*, Fr. *genièvre*, It. *ginepro*, juniper, from Lat. *juniperus*, juniper; corrupted by popular etymology with *Geneva*, a city of Switzerland). One of the names of the juniper-berry, but also often applied to the spirit distilled from grain and flavored with juniper-berries, and manufactured in Holland, and hence called Hollands or Holland gin. The word gin is itself a corruption of Geneva.

GENEVA, LAKE (Fr. *Lac Léman*, the *Lacus Lemanus* of the Romans). A crescent-shaped lake, the largest in Switzerland, extending around the northern part of the French Département of Haute-Savoie, and with its west, north, and east shores bordering the cantons of Geneva, Vaud, and Valais (Map: Switzerland, A 2). It has an area of 224 square miles. It is 45 miles long, and attains a maximum breadth of 8½ miles between Morges and Amphion; its greatest depth is 1015 feet, between Evian and Ouchy. At the Strait of Promenthoux, 2 miles wide, it is divided into the Great Lake, about 39 miles long, with an average breadth of 6 miles, and the Little Lake, 6 miles long and 2 miles broad. The river Rhône, turbid and yellow, enters the lake at the northeastern end, and leaves it at the southwest, through the city of Geneva, perfectly clear and of a deep-blue tint. The deposits of this river at the northeastern end have contracted considerably the area of the lake, former towns and villages on its shores in some cases now being miles inland. About twenty other streams, all insignificant, flow into the lake, which is 1230 feet above the sea; with the melting of the mountain snow in summer the lake rises from 6 to 8 feet above its usual level. It is subject to the phenomena known as *seiches*, caused by alterations in the atmospheric pressure, which frequently occasion a rise and fall of from 2 to 5 feet in the course of half an hour. The *seiches longitudinales* traverse the lake from one end to the other, the highest on record being over 6 feet high; the *seiches transversales* cross from the Swiss to the French side in ten minutes. The lake is never entirely frozen over. It abounds in trout, lake salmon, perch, pike, and carp.

The beauties of Lake Geneva have been celebrated for centuries, and annually attract thousands of tourists; its shores have been favorite residential resorts of numerous celebrities. The shore on the side of the Pays de Vaud is celebrated for the magnificence of its scenery; the southern French shore rises solemn and stern, with the mountains of Savoy in the background. From the Lake of Geneva Mont Blanc is visible, and, although 40 miles distant, is often reflected in its intensely blue waters. The principal places on Lake Geneva are: Geneva, Coppet, Nyon, Morges, Lausanne (with its port, Ouchy), Vevey, Montreux, Evian-les-Bains, and Thonon.

GENEVA, UNIVERSITY OF. A Swiss university, known under its present name only since 1873, but the outgrowth of one of the oldest and most famous of Protestant institutions of learning, the Academy of Geneva, founded by the Genevan Republic in 1559. The academy had the usual faculties of philosophy, science, law, and theology; but the last named, under the direct oversight of Calvin and Beza, was the most renowned. The institution soon became the leading resort of Protestant scholars and students of all nations, and lent much lustre to a city already famous for its curious theocratic republican form of government. After the Huguenot persecutions Geneva became more than ever the centre of French Protestant culture and influence, a characteristic maintained throughout the eighteenth century. The names of Scaliger, Casaubon, De Saussure, and De Candolle have given the university distinction. It is still a place of educational importance. Its 1100 students, many of them from abroad, are mainly in the faculties of medicine and philosophy. Women are admitted on the same conditions as men.

GENEVA ARBITRATION. The international adjudication of the controversies between the United States and Great Britain growing out of the depredations of the *Alabama* and other Confederate cruisers upon the commerce of the former country during the Civil War. The arbitration tribunal was instituted as the result of the Treaty of Washington, signed February, 1871, by the joint commission which had met at Washington to settle those controversies. For the nature of the differences thus adjudicated and the constitution of the tribunal and the results of the arbitration, see **ARBITRATION, INTERNATIONAL**; **ALABAMA CLAIMS**.

GENEVA BIBLE. See **BIBLE**.

GENEVA CATECHISMS. A smaller and a larger French catechism by Calvin, published in 1536 and 1541, the second of which was afterwards translated and adopted as the formulary of the Reformed churches of Switzerland, France, and Hungary.

GENEVA CONVENTION. An agreement concluded at an international conference which was held at Geneva, 1864, under the presidency of General Dufour, the Swiss Plenipotentiary, for the purpose of ameliorating the condition of the sick and wounded in time of war. The credit of originating this conference belongs to two citizens of Geneva, Dunant, a physician, who published a startling account of what he had witnessed in two military hospitals on the field of Solferino, and his friend Moynier, chairman of the Society of Public Utility, who took up the idea of 'neutralizing the sick-wagons,' formed associations for its agitation, and at length pressed it upon the governments of Europe, most of which sent representatives to the conference. The convention was drawn up and signed by them on August 22d, and since then it has received the adherence of every European power, and one Asiatic (viz. Persia). The convention consists of ten articles, of which the last two are formal. The others provide: (1) for the neutrality of ambulances and military hospitals as long as they contain any sick; (2) for that of the staff; (3) that the neutrality of these persons shall

continue after occupation of their hospitals by the enemy, so that they may stay or depart, as they choose; (4) that if they depart, they can only take their private property with them except in case of ambulances, which they may remove entire; (5) that a sick soldier in a house shall be counted a protection to it, and entitle its occupants to exemption from the quartering of troops and from part of the war requisitions; (6) that wounded men shall, when cured, be sent back to their own country on condition of not bearing arms during the rest of the war; (7) that hospitals and ambulances shall carry, in addition to the flag of their nation, a distinctive and uniform flag bearing a red cross on a white ground, and that their staff shall wear an arm-badage of the same colors; (8) that the details shall be left to the commanders.

A second conference was held at Geneva on the same subject in 1868, and a supplementary convention drawn up. It consists partly of interpretations of the former convention, and partly of an application of its principles to maritime wars. Its main provisions are these: That when a person engaged in an ambulance or hospital occupied by the enemy desires to depart, the commander-in-chief shall fix the time for his departure, and when he desires to remain, that he be paid his full salary; that account shall be taken in exacting war requisitions not only of the actual lodging of wounded men, but of any display of charity toward them; that the rule which permits cured soldiers to return home on condition of not serving again shall not apply to officers, for their knowledge might be useful; that hospital ships, merchantmen having wounded on board, and boats picking up wounded and wrecked men shall be neutral; that they shall carry the red-cross flag, and their men the red-cross armlet; that hospital ships belonging to the Government shall be painted white with a green strake; those of aid societies white with a red strake; that in naval wars, any strong presumption that the convention is being abused by one of the belligerents shall give the other the right of suspending it toward that power till the contrary is proved, and, if the presumption becomes a certainty, of suspending it to the end of the war. See **RED CROSS SOCIETIES**; **WAR**.

GENEVIEVE, jèn'e-vêv'. The heroine of a poem by Coleridge, which is sometimes known by the same name, but more frequently by that of "Love." It was added to the second edition of the *Lyrical Ballads* (1800).

GENEVIEVE, zhèn'vyáv', SAINT (Lat. *Genovefa*) (c.422-512). The patron saint of Paris, and the subject of many popular and highly poetical legends. She was born about 422, in the village of Nanterre, near Paris, where, as a mere child, she attracted the notice of Saint Germanus of Auxerre (q.v.), who passed a night at Nanterre on his way to Britain, about 430, and who is said to have marked her out as specially destined to a life of holiness and purity. She devoted herself to a life of virginity and conventual seclusion. On the death of her parents she removed to Paris; and her active charity, and the extraordinary reputation for sanctity which she acquired, both there and in other cities of France which she visited on missions of Christian benevolence, won for her the admiring veneration, not alone of her own people, but even of

the heathen or half converted. The Frankish rulers Childeric and Clovis set prisoners free at her intercession. When, about 450, it was proposed to abandon Paris in alarm at the approach of Attila and the Huns, Geneviève, assembling the matrons and consecrated virgins in one of the churches, exhorted them to avert, by prayer and fasting, the threatened calamity. The unexpected alteration of the direction of Attila's march added still more to her reputation and to her influence. Later, when Clovis besieged the city, Geneviève, with her sisters in religion, set out on an expedition for the relief of the starving people, and successfully conveyed to Paris a supply of provisions. She died in Paris, January 3, 512. Under her patronage, and with her name, a religious congregation of priests—The Canons of Saint Geneviève—was founded in the eleventh century, which, with some vicissitudes, continued until the Revolution (1789). A religious congregation of women, under the name of 'Sisters of Saint Geneviève,' was established in 1636 for the purpose of caring for the sick and the education of girls. An edifice built in her honor, and upon the supposed site of her tomb, in 1764-90, which is now called the Pantheon, contains the famous mural painting of the saint by Puvis de Chavannes. Adjoining is the Library of Saint Geneviève, containing 200,000 volumes, and near by is a relic of the Abbey of Saint Geneviève. Consult her life by Vidian (Paris, 1883).

GENEVIEVE DE BRABANT, de brá'bân'. According to the legend, daughter of a duke of Brabant, and wife of Siegfried, Count Palatine of Treves in the first half of the eighth century. During Siegfried's absence with Charles Martel against the Saracens, she was criminally solicited by Golo, a knight in whose charge her husband had left her. When he returned, finding that his wife had given birth to a child (which in reality was his own), he ordered both mother and child to be killed. But their lives were preserved, and many years later the repentant Siegfried found them out and acknowledged the injustice of his suspicions. Consult Sauerborn, *Geschichte der Pfalzgräfin Genoveva und der Kapelle Frauenkirchen* (Regensburg, 1856).

GENGA, jën'gá, GIROLAMO (c.1476-1551). An Italian painter, architect, and sculptor, born at Urbino. He received instruction from Luca Signorelli, whom he assisted in the frescoes in the Chapel of the Virgin at Orvieto, and afterwards became the pupil of Perugino, in whose company he met Raphael. The frescoes he painted in the Petrucci Palace at Siena (1508) are destroyed. Four years afterwards he went to Urbino, and did some decorations at the command of the Duke Guidobaldo II. Soon after this he went to Rome, where he executed what is probably his best picture, "The Resurrection," in the Church of Saint Catharine of Siena at Rome. Recalled to Urbino, he worked for the Duke, in company with Timoteo Viti, and after his patron's deposition went with him to Mantua, and returned with him in triumph to Urbino. From that time on his work was architectural. He restored the Palace of Castel Durante at Urbino, and built Monte Imperiale, near Pesaro; the Church of San Giovanni Battista, at Pesaro; and Santa Maria delle Grazie, at Sinigaglia, and the cloister of the Zoccolanti, at Monte Baroccio.

GENGHIS, JENGHIS, or ZINGIS KHAN, jën'gis kán (1162-1227). A celebrated conqueror, originally known as Temujin, the title Genghis Khan merely signifying Great Khan or Ruler. He was born at Deylun Yeldak, near the northern bend of the Hwang-ho, in Mongolia, being the son of Yesuka Bahadur, a Mongol chief who ruled over the tribe of Neyrun, dwelling between the Amur and the Great Wall of China, and paying tribute to the Khan of East Tartary. On his father's death Temujin assumed the reins of government, though only thirteen years of age. Some of the subject tribes, however, refused to obey him, and chose another chief belonging to the same family. A war of several years' duration was the result, at the termination of which the young ruler was compelled to retire to Kara-korum, the capital of Toghrukh Khan, Khan of the Keraites and place himself under that monarch's protection. Ugh Khan gave him his daughter in marriage, and appointed him to the command of the army, in which capacity Temujin gave proof of great military talent, conquering the Mekreit, Tanjut, Jellaier, and other neighboring tribes. His growing reputation aroused the jealousy of his master, who ordered him to be assassinated; but Temujin fled to his own country, where he arrived after many hairbreadth escapes at the head of 5000 cavalry. Raising an army, he marched against his father-in-law; and Toghrukh, vanquished in battle in 1203, sought refuge among the Naymans, but was slain by the guards situated on the frontiers. Temujin immediately seized upon Toghrukh's dominions. In the following year a number of Tatar tribes, alarmed at his increasing power, formed a powerful league against him. The command was given to Tai Ugh Khan, chief of the Naymans; but in a battle fought on the banks of the Amur Temujin routed his enemies, slew their leader, and became at once master of almost all Mongolia. Grand views of conquest seemed now opened up before him. In the year 1206 he convoked a general assembly on the banks of the Onon, a tributary of the Amur, flowing through his native land. This meeting was attended by deputies from the subjugated hordes of Tartary, and the astute monarch contrived to obtain a religious confirmation of his designs. Up to this period he had borne the name of Temujin; but a renowned magician or priest, surnamed Bout-Tangri ('Son of Heaven'), venerated by all the Mongols, now came forward and pronounced him Genghis Khan—i.e. Greatest of Khans, or Khan of Khans, declaring that he should rule over the whole earth. The deputies were duly impressed. About this time the Uigurs, an agricultural and civilized people, inhabiting the country at the sources of the Hwang-ho and Yang-tse-kiang, voluntarily submitted to his sway. From this people, who professed Buddhism, the Mongols appear to have acquired a knowledge of writing. They adopted the Uigur alphabet, but preserved their own language, and Genghis selected one of the tribe to instruct his children.

The most important incident in the career of Genghis was the conquest of the northern part of China or Khatai. The immediate cause of the war between him and the Emperor of China, Tchong-Hei, was the refusal of the former to recognize the latter as his suzerain or liege lord. Most of the Tatar tribes which Genghis had subdued were really vassals of the Chinese Empire; and Tchong-

Hei, though he had not interfered to prevent the conquests of the Mongols, now called upon Genghis to acknowledge his superiority by paying tribute. Genghis immediately prepared for war, scaled the Great Wall in 1211, and after a series of bloody and protracted campaigns succeeded in taking Peking in 1215. Meanwhile Genghis had quelled an insurrection, headed by the Naymans, and conquered the Gur-Khan of Kara-Khatai. These tribes were nearly exterminated in a great fight which took place near the sources of the Yenisei. Pressing westward, the Mongols at length reached the Sihun, the northeastern boundary of the Empire of Khwarezm or Khorasmia, whose ruler, Ala-ed-Din Mohammed, was one of the most powerful sovereigns in Asia. The dynasty to which he belonged had risen into power through the weakness of the Seljuk sultans; and its sway now extended from the borders of Syria to the River Indus, and from the River Sihun to the Persian Gulf. The murder of some Mongol merchants at Otrar, a town on the Sihun, afforded Genghis a pretext for invasion. In 1219 an army of 700,000 men, according to the Eastern chroniclers, commanded by Juji, the son of Genghis Khan, entered Khwarezm. Samarkand, Bokhara, and all the other important cities of the country were captured. In 1221 Genghis Khan assumed personal command. The Mongols in three separate divisions now scoured and ravaged Khwarezm in all directions. In the course of five or six years they overran Persia, subdued the inhabitants of the Caucasus, crossed into Russia, and plundered the land between the Volga and the Dnieper. They swept over the whole of Southern Asia, as far as the Sutlej in Northern India, but the exhaustion of the Mongol hordes compelled Genghis to return to Karakorum, the capital of his empire, in 1224. During his absence his generals had been prosecuting the Chinese war with the greatest success. Genghis had still the old thirst of conquest; and, having recruited his forces, he led them across the great desert of Gobi to the Kingdom of Tanjout, in the northwest of China, the capital of which, Nin-hai, he besieged. Disheartened by the loss of the greater part of his army, the King of Tanjout promised to capitulate at the end of a month; but in the interval Genghis died, August 24, 1227, on the hill Liou-pai, worn out with years and toils. He is said to have had five hundred wives and concubines, and to have left a great number of children, among three of whom he divided his enormous possessions. The third son, Ogotai, was appointed Grand Khan, and received for his share the region now called Mongolia, with Khatai or Northern China as far north as the mouth of the Amur. The second son, Tcheghatai, received Turkestan north of the Amur. Juji, for his share, obtained Kiptchak (q.v.) and all the country west and north of Turkestan, an immense tract extending from the Caspian Sea almost to the Arctic Ocean. Sanguinary and barbarous though he was, Genghis showed many statesmanlike qualities and many virtues. He was a strict monotheist, but tolerated all religions; exempted from taxes and military service physicians and priests; made obligatory the practice of hospitality; established severe laws against adultery, theft, and homicide; organized a system of communication throughout his dominions, mainly no doubt for military purposes; and so

thoroughly organized what may be called the police or civil authority, that it was said that one might travel without fear or danger from one end of his empire to the other. He would appear to have respected men of learning, and to have retained several of such about his person. The only memorial of Genghis now known to exist is a granite tablet, with a Mongol inscription deciphered by Schmidt of Saint Petersburg, discovered among the ruins of Nertchinsk. This tablet had been erected by Genghis in commemoration of his conquest of the Kingdom of Kara-Khatai. Consult: Howorth, *History of the Mongols* (London, 1876-88); Erdmann, *Temudschin der Unerschütterliche* (Leipzig, 1862); Douglas, *Life of Genghis Khan* (London, 1877).

GENGLER, gēng'lēr, HEINRICH GOTTFRIED (1817-1901). A German jurist. He was born at Bamberg, and educated at Würzburg and Heidelberg. For more than fifty years he occupied the chair of law at the University of Erlangen. His works on German law include: *Das deutsche Privatrecht in seinen Grundzügen für Studierende* (4th ed. 1892); *Germanische Rechtsdenkmäler*, with a glossary (1875); *Des Schwabenspiegels Landrechtsbuch* (2d ed. 1875).

GÉNIE DU CHRISTIANISME, zhá'né' du krēs'tyá'né's'm (Fr., Genius of Christianity). A celebrated work by Chateaubriand (1802), a defense of Christianity on purely æsthetic and emotional grounds, avoiding all frank discussion of dogma. In it the author's purpose was to demonstrate "that of all the religions that have ever existed, the Christian religion is the most poetic, the most human, the most favorable to liberty, to the arts, and to literature, and that there is nothing more divine than its system of morals." The work gathers together illustrations of the sublime in Christian dogma, poetry, art, and literature, and besides its religious importance, had a distinct influence on the literary tendency of the nineteenth century.

GENII, jē'nī (Lat., guardian spirits). Spirits supposed to protect human beings, or tutelary divinities who presided over places and things. The classical nations believed that there were orders of spirits whose function it was to take in charge the infant at birth, to watch over the person day and night during the whole life, to point out to him the right and fortunate thing to do, to warn him of danger and wrongdoing, and thus to guide him safely throughout his life. The genii had access to their wards at all times, and could change themselves into any desired form. The demon (Gk. *δαίμων*) of Socrates is often mentioned as an example of a guardian spirit. In his case, however, the philosopher seemed to have believed not so much in an ever-present genius prompting him, as in a friendly hand holding him back from danger and wrongdoing. But, according to the classical belief, not only persons were thus cared for, but also there were special spirits in whose keeping the protection of the land itself was believed to be placed. Rome, for example, had its tutelary genii, and the Lares and Penates were looked upon as household gods embodying the spirit of the hearth and home. As such, the various genii received honors and divine worship in ancient Italy and Greece.

It is an easy step from this belief in guardian spirits to that in evil, misleading, tempting spirits, who are sent either to test the virtues

of the good or to guide the evil mortal in ways of wrongdoing. (See DEMONOLOGY.) The Greeks had *kakodaimones* as well as *agathodaimones*. The Romans came to believe in evil *genii* as well as good. It will be readily understood that the early Christians seized upon these ideas, and out of them grew the belief in guardian angels, ministering spirits, and evil *genii* or spirits.

In classical art the *genii* are sometimes represented in the form of a youth with wings, sometimes as closely wrapped in a mantle and holding within the hand some emblem of their office; and the *genius loci* or guardian spirit of a place is often pictured as a serpent partaking of some offering on an altar. Under Christian influence the good *genius* is frequently represented as an angel; the bad *genius* under some evil guise.

The idea of such spirits is a belief widely spread and by no means confined to the classical nations or ancient peoples or uncivilized races. The same sort of a conception prevailed in ancient and modern India, and the Zoroastrian doctrine of the *fravashis* in the Avesta as heavenly spirits presiding over man and over the house, village, tribe, and country shows how old this notion was in Persia. The Eskimo recognize the same idea in the spirit of the person after whom one is named acting as his guardian *genius*. Among the Mohammedans there is a kindred belief in the existence of *jinn*s, spirits of good and spirits of evil, who could assume any form.

The rôle played by the *jinn*s in the *Arabian Nights*, or by the *afrits*, or evil *genii*, in Arabic stories, is familiar to every reader of Oriental literature or of Eastern folk-lore. With the Arabic *jinn*, the Latin *genius* became entangled in the popular mind through the influence of the *Arabian Nights*, although there was no etymological connection between the two. The Greek word *dæmon*, which was originally used in the general sense of spirit, as explained above, has become degraded to mean *demon* in Christian theology. The question of the belief in *genii* lies near the inquiry into the origin of religion itself, but it is not difficult to trace backward all such beings to the primitive, childish faith which endows everything with human traits and capabilities. The shadow, the dream-self, the physiological hallucination all helped to give substantiality to the creatures of the imagination. See ANGELS; MAN, SCIENCE OF; APPARITIONS; DEMONOLOGY; JINN; RELIGION, COMPARATIVE.

GEN'IPAP (from *genipapo*, the native name). A much-esteemed fruit of the West Indies and warm parts of South America. The tree which yields it is *Genipa Americana*, of the order Rubiaceæ. The fruit is a two-celled berry, containing many seeds, about as large as an orange, of a whitish-green color, with a dark-purple juice of an agreeable, vinous taste. The species resembles the popular hothouse shrubs of the genus *Gardenia*, of which genus the Cape jasmine (*Gardenia jasminoides*) is perhaps the best-known species.

GENIPI, jèn'î-pè. See ACHILLEA.

GENIS'TA. A genus of low shrubs of the natural order Leguminosæ. The species, of which there are about eighty, natives of the Old World, have small deciduous or almost evergreen leaves, terminal racemes, or clusters of handsome yellow flowers, borne in great abundance in spring or

summer, and little pods. None of the species are perfectly hardy in cold climates, and only *Genista tinctoria*, *Genista Angelica*, and *Genista Germanica* can withstand the winters when protected by straw or other covering. They succeed best on sandy or rocky, well-drained soils in sunny places. The so-called *genista* that the florists usually bring into blossom about Easter time is a species of *Cytisus*.

GENITIVE (Lat. *genitivus*, relating to birth, from *gignere*, to produce). The name of one of the 'cases' in grammar. (See DECLENSION.) In such an expression as (Latin) *regis filius*, (English) the *king's son*, the form *regis* or *king's* is called the genitive case; and according to the usual explanation, this name was given it because it indicates the source or origin of the thing joined with it. In reality, however, the terms of grammar were originally applied, not to the parts of speech, but to the elements of thought; they were logical terms before they were grammatical. The Greek writers on dialectics, in analyzing the different parts of an expressed thought, had distinguished the principal notion, the subject or nominative as it is called, from secondary or dependent notions; the dependency of the latter they expressed by the word *πρῶσις* (Lat. *casus*), a fall or leaning of one thing upon another; and in such a proposition as 'The king's son is dead,' they indicated the exact nature of the dependence by calling it the *γενική πρῶσις*,—i.e. the case showing the genus, kind, or class, the generic case; for while the name 'son' is applicable to every man having parents, 'king's son' is limited to the class of sons having kings for their fathers. The names thus applied to ideas were transferred to the words expressing them by the Greek grammarians of Alexandria, and were afterwards translated into their Latin equivalents by the Greek grammarians who taught their language to the youth of Rome. But by this time the terms had become strictly technical, and their original significance little thought of; and this may account for the Greek *γενική*, the Latin equivalent for which is *genialis*, being rendered by *genitivus*, generating or producing, which would have been expressed in Greek by *γεννητική*.

In English the genitive is the only case or relation among nouns expressed by a difference of termination, and even it is often expressed by the preposition *of*: as the *river's* brink, or the brink *of the river*. From the frequency with which the form in 's indicates that one thing belongs to another, it is often called the *possessive* case. But this name is little applicable in such expressions as a *day's* journey; still less in many cases where the genitive is used in the ancient languages—e.g. *fons lactis*, a fountain of milk. The *generic* case, however, meaning that which limits the other noun to a class or kind, will be found to express the real relation in every conceivable combination.

The termination 's was often erroneously supposed to be a contraction for *his*, as if 'the king's son' = 'the king his son'; but it is a genuine relic of the inflections (q.v.) common at an early stage to all the Indo-Germanic languages. *s* was one of the prevalent endings of the genitive singular in the Anglo-Saxon. With the ordinary plural termination in *s*, and sometimes in the singular when the noun ends in *s*, the additional

s of the genitive is omitted, for the sake of the sound, as kings' sons, Francis' store.

GENIUS, jên'yūs (Lat., tutelary godling, from *gignere*, Gk. *γεννέω*, *gignesthai*, Skt. *jan*, to be born). The name given by the ancients to the lesser divinities, good and bad, to whose charge are committed the destinies of the individual human being. This usage is still retained, metaphorically, in such phrases as 'his good (or evil) genius prompted him.' Hence arises, further, the employment of the term for a special aptitude or characteristic; as when we speak of the bent of a man's genius, or of the genius of nineteenth-century thought. The current meaning of the word, however, which naturally suggests itself in the absence of a limiting context, is that of 'an ability that is exceptionally high, and at the same time inborn' (Galton). That man is possessed of genius—or is a genius—whose natural abilities are of an unusually high order and display themselves in creation or construction; while that man is talented whose natural abilities, though far above the average, depend for their realization upon education and training, and whose superiority is displayed rather in acquisition or in artistic execution than in invention. "The man of talent," says Galton, "is one in four thousand; the man of genius is one in a million."

Many attempts have been made to define genius. Carlyle remarks that it means, first of all, "the transcendent capacity of taking trouble"; and when we think of the leaders in science, or of great military geniuses, we shall admit the measure of truth in his statement. Lowell, on the contrary, declares that 'talent is that which is in a man's power; genius is that in whose power a man is'—an account that seems to contradict Carlyle's definition outright, but one whose justice we shall concede when we think e.g. of a poet like Shelley. This contrariety of description shows how foolish is the attempt to put a technical interpretation upon the word 'genius,' or to characterize a 'typical' genius. There is a popular belief that the man of genius is a puny and unhealthy being, all brain and no muscle; and the work of Lombroso has given new vogue to the old idea that genius is closely related to insanity.

Now, there can be no doubt that men of extraordinary gifts have often had poor constitutions; we have only to think of the philosopher Kant as an example. But the rule is to the reverse effect: a "collection of living magnets in various branches of intellectual achievement" is good to see, writes Galton, for the reason that they are "such massive, vigorous, capable-looking individuals." For the second belief there seems, unfortunately, to be better evidence. We are not called upon to suspect insanity wherever we find an unusually high intelligence: this position is negated by the remark just quoted. But high intelligence implies a finely wrought and peculiarly excitable brain; and these characteristics of the nervous system, balanced in the case of the genius by preservative conditions, may appear in his near relatives, without the required checks and preservatives, as some form of eccentricity, if not of mental derangement. Consult: Galton, *Hereditary Genius* (London, 1892); Lombroso, *The Man of Genius* (New York, 1891); Baldwin, *Mental Development* (New York, 1897); Nordau, *Degeneration* (New York, 1895).

GENLIS, zhân'lé, STÉPHANIE FÉLICITÉ DUCREST DE SAINT-AUBIN, Countess de (1746-1830). A French novelist, dramatist, and memoir writer, born at the Château of Champeéri, near Autun. She afterwards became preceptress (1781) of the sons of the Duke of Chartres, known later as Philippe Egalité. Among these was the future King Louis Philippe, for whom she wrote several educational books. During the Revolution she lived in Switzerland, in Berlin, and in Hamburg. Napoleon recalled and pensioned her. She continued to write voluminously during the Revolution, and seems to have enjoyed the literary quarrels roused by her cleverly sarcastic *Diners du baron d'Holbach*, witty persiflage of the intolerant fanaticism of eighteenth-century philosophy. Her *Mémoires inédits sur le XVIIIème siècle et la révolution française* (10 vols., 1825), and a novel, *Mlle. de Clermont* (1802), are other noteworthy works among her 90 volumes, many of which were translated into English. She died in Paris. Consult: Sainte-Beuve, *Causeries*, vol. iii. (Paris, 1857); Bonhomme, *Madame de Genlis* (Paris, 1885); and Carotte, *Madame la comtesse de Genlis* (Paris, 1893).

GENNADIUS (Lat., from Gk. Γεννάδιος). A learned Greek, Patriarch of Constantinople, c.1453-59. His lay name was Georgius Scholarius. But little is known of his life, and it has even been thought that there were two writers of the same name living at the same period. The first appears in history in 1439, when he accompanied the Emperor John Palæologus to Florence, whither the Council of Ferrara had been adjourned, and where an effort was made to unite the Eastern and Western churches. (See FERRARA-FLORENCE, COUNCIL OF; EUGENIUS IV.) Scholarius, at this time a layman, played a politic and cautious part, admitting the necessity of union, and trying to draw up a form which, from vagueness and ambiguity, might be accepted by both parties. After his return to Constantinople he became a monk, and took a position with respect to the union highly unacceptable to the Roman party. He next appears in 1453, after the capture of Constantinople by the Turks. The conqueror Mohammed, finding that the patriarchal chair had been vacant for some time, chose the monk Gennadius for the office. At the request of Mohammed he drew up a symbol or confession of faith, which is valuable as an expression of the belief of the Greek Church. After four or five years he resigned his episcopal dignity and retired to a monastery. Gennadius was a prolific writer; many of his extant works have never been edited. He was an able champion of the Aristotelians in the contest between Platonism and Aristotelianism which marked the transition from mediæval to modern thought.

GENNARI, jên-nâ'rè. A family of Italian painters of the sixteenth and seventeenth centuries.—BENEDETTO (1550-1610), called The Old, born at Cento, near Bologna, was the most celebrated. He was the master of Guercino.—BENEDETTO (1633-1715), called The Young, also was born at Cento. He traveled in France and England, and painted for Louis XIV. and James II. He is best known as an excellent copyist and imitator of Guercino.

GENNESARET, jên-nēs'sâ-rèt, LAKE OF. A body of water in Palestine, through which flows the River Jordan. The old Hebrew name was Chinnereth or Chinneroth (see Num. xxxiv. 11;

Joshua xii. 3, xiii. 27), also used of a city (Joshua xix. 35), and of a district (I. Kings xv. 20), both in the neighborhood of the lake. The name Gennesaret, or, more correctly, Gennesar, from the 'Land of Gennesaret' (q.v.) on the northwest shore of the lake, was in use certainly as early as the first century B.C. (I. Macc. xi. 67). This is the name used almost without exception in Josephus. In the Gospels 'Sea of Galilee' is the usual designation. After Herod Antipas built the city of Tiberias on its shore it became known as the Sea of Tiberias, which is the basis of the modern name Bahr Tabariyeh. The lake is 13 miles long by 7 miles wide, irregularly oval in shape, widest at the northern end. It lies in a deep basin in the great cleft which extends from the Lebanon to the Red Sea. The surface is 680 feet below the level of the Mediterranean. Its greatest depth is not over 200 feet. It is completely encircled by a beach, the surrounding hills in no case touching the water's edge. Along the eastern shore the beach is but a narrow strip about half a mile wide, beyond which the hills rise abruptly to a height of nearly 2000 feet above the lake. To the south is the low, rapidly descending Jordan Valley, as wide as the lake itself. From the exit of the Jordan to Tiberias, on the west, a mile or so from the water, lies a black and barren ridge of the Galilean hills, while north of this, extending nearly to the entrance of the Jordan, is the broad and fertile plain of Gennesaret. The water of the lake is sweet, except in the neighborhood of the hot springs near Tiberias, and somewhat warm. The hot springs are evidence that the volcanic activity, which in ages past wrought such great changes in this locality, has not entirely ceased. The surface of the plateau east of the lake is the overflow of volcanoes once active in the Hauran. Shut in by high hills except to the south, the lake is subject to sudden and severe winds which, rushing down the ravines, often lash the waters into dangerous fury (cf. Mark iv. 37; Luke viii. 23). The neighborhood of the lake once teemed with population. Several of the great trade routes of Southwestern Asia converged here. Communication with the whole world was frequent and easy. The waters abounded in fish and were covered with sailing craft, many of which were used in the extensive fishing industry. The fertile western shore was highly cultivated and yielded its products through all the months of the year. Around this small sheet of water were clustered some nine or ten flourishing cities, each, it is said, with not less than 15,000 inhabitants: Chorazin, on the slopes west of the Jordan's entrance; Capernaum and Magdala in the plain of Gennesaret; on the western shore, Tiberias with its famous and popular baths, and Tarichæa with its great fish-curing industry, whence the fish of Galilee were exported throughout the Roman world; Hippos and Gamala on the eastern plateau, with Gadara a few miles southeast; Bethsaida at the entrance of the Jordan, and Sinnabris at its exit; and Homonaa two miles down the valley. At present all these, except Tiberias, have passed away, the sites of some cannot be identified, the soil is cultivated in but few spots, boats are rarely seen, and the hills are treeless and deserted.

It was about the northern part of this sea that Jesus passed the greater part of His public ministry. Four of the first disciples were Galilean fishermen (Matt. iv. 18-22; Mark i. 16-20),

and the miracles of the walking on the water (Matt. xiv. 22-33), the miraculous draught of fishes (Luke v. 4-7), the stilling of the tempest (Matt. viii. 23-27; Mark iv. 35-41; Luke viii. 22-25), the feeding of the multitude (Matt. xiv. 13-21; xv. 29-39; Mark vi. 31-44; viii. 4-9; Luke ix. 10-17; John vi. 1-14), and many other miracles and events in the life of Jesus are closely associated with the lake. Consult: Merrill, *Galilee in the Time of Christ* (New York, 1891); id., *East of the Jordan* (New York, 1881); George Adam Smith, *Historical Geography of the Holy Land* (London, 1894).

GENNESARET, LAND OF. A district northwest of the Lake of Gennesaret (or Sea of Galilee), from which the lake took its name. The meaning of the word (more properly Gennesar, Gk. Γεννησαρ) is disputed. The Jewish doctors thought it a corruption of the word Chinnereth. (See GENNESARET, LAKE OF.) More probably it was made up of *gan* (garden), or *gai* (valley), and a second element no longer discernible. The modern name is Ghuweir, i.e. Little Ghor, the large Ghor being the Jordan Valley. The classic description of the locality is that of Josephus (*Jewish War*, iii. 10, 8), who speaks of it as "wonderful in nature and beauty," not "denied any plant because of its fertility," where walnuts, figs, olives, sycamores and royal grapes vied with each other in luxuriance and abundance, where all climes and seasons seemed to harmonize, and which, in addition to its balmy air "was irrigated by a most fertilizing spring called Capharnaum." It was between three and four miles long and two-thirds of a mile wide, extending from a spot about three miles west of where the Jordan enters the lake as far as Mejdal (the ancient Magdala?), where the hills approach within half a mile of the water. There are a number of springs in the locality, that of which Josephus speaks being probably the one known as Ain-et-Tabijeb, whence an aqueduct brought the water to the plain. Capernaum, Jesus' 'own city,' was in Gennesaret, probably on the site of the modern Khan Minyeh. For literature, see GENNESARET, LAKE OF.

GENOA, jèn'ô-à (It. *Genova*, Genoese, *Zèna*, Fr. *Gènes*). A fortified seaport of Italy, capital of the Province of Genoa, in the Compartimento of Liguria, formerly the capital of the Republic of Genoa, situated on the Gulf of Genoa and the Bisagno River, in latitude 44° 24' N. and longitude 8° 54' E. (Map: Italy, C 3). It is the first port and most important commercial centre of Italy. The mean temperature is 61° Fahr., 9 degrees above that of Turin in the interior, 100 miles northwest. At Genoa the January temperature averages 46° and seldom falls below 23°, but the changes are sudden, and the winter winds from the surrounding Ligurian Apennines are raw. The average temperature at Genoa in July is 76°.

Seen from the sea, the city justifies its title of 'la superba' (the proud). In a nine-mile circuit it rises like an amphitheatre of churches, palaces, and houses. Picturesqueness is added to the panorama by terraced gardens, and by bridges, the most remarkable of which is the Ponte Carignano, that leads over seven-story buildings to the Church of Carignano and was built in 1718 by the Sauli family. It is 361

feet long, 17 feet wide, and 112 feet high. The old town is a network of steep, narrow streets lined with high buildings; but the modern encircling and radiating boulevards are broad and magnificent. Among these avenues are the imposing Via di Circonvallazione a Mare, on the site of the exterior fortifications, and the Via di Circonvallazione a Monte, stretching superbly along the heights back of the city. One of the most characteristic streets in the business section is the Via Garibaldi, with stately palaces. The Piazza Deferrari, with its large equestrian statue of Garibaldi, is the converging point of the extensive system of electric street railways (31 miles in 1899). There are also three lines of cable cars.

The harbor, with an area of over 500 acres, consists of the Porto, or old harbor, with 19 feet of water, the Porto Nuovo, with 32 feet of water, and the Avamporto for war vessels, with 45 feet of water. The Porto is partially inclosed by the Molo Vecchio, said to have been built in the twelfth century, and by the eighteenth-century Molo Nuovo. The additions to the Porto were made (1877-95) at an expense of over \$12,000,000, of which the Duke of Galliera contributed \$4,000,000. The harbor now has five miles of quays, a steel floating dock 282 feet long, and two stone dry docks, 588 and 722 feet long respectively. To the west, on rocky Cape Faro, stands the lighthouse (La Lanterna), 384 feet high, with a magnificent view of the sea, harbor, city, Riviera, and mountains. Modern batteries and forts render the city a sea and land fortress of great strength. The rowing and bathing in and about the harbor form one of the attractions of the city.

Genoa is famous for the number of marble palaces in the style of the best period of the Renaissance. It is also unique for its many noble staircases. It accordingly presents a proud and grand appearance, and is the least agreeable and *sympathique* of the great Italian towns. The most splendid palaces it owes to the designs of Galeazzo Alessi (died 1572) and his successors Bianco (1604-56), Tagliafico (1729-1812), and Cantoni (1736-1818), who interpreted Alessi in the spirit of Michelangelo. The oldest of the 82 churches is the Cathedral of San Lorenzo, founded in 985, rebuilt in the Romanesque style about 1100, restored in Gothic in 1307, and given a Renaissance dome in 1567. The choir was modernized in 1617, and in 1896 the interior was properly restored. In it are statues, paintings, vestments, relics, of which perhaps the most interesting is the Sacro Catino, in which tradition says that Joseph of Arimathea caught drops of the blood of his crucified Saviour. There are excellent altarpieces by Baroccio and Battista. The most magnificent church in Genoa is the Santissima Annunziata, the most beautiful is the sixteenth-century Santa Maria di Carignano. The Annunziata dates from the sixteenth century, and is a basilica with a dome, the vaulting being borne by fluted and inlaid shafts of marble. Services are held in English at the Episcopal Church, at the Presbyterian Church, and at the Sailor's Missions.

Genoa, so rich in architecture, is poor in masterpieces of painting and sculpture. The principal picture galleries are in the Palazzi Rosso and Bianco, presented to the city by the Duchess of Galliera, in the seventeenth-century

Palazzo Balbi-Senarega (private), and in the Palazzo Durazzo-Pallavicini, which also contains a library with examples of early printing. The Rosso collection embraces meritorious paintings by Paris Bordone, Bassano, and Van Dyck. The Bianco contains letters by Columbus, majolica, coins, miniatures, tapestries, Oriental vases, and noteworthy paintings by Rubens and David. The Balbi-Senarega Palace is perhaps the most pleasing one in the city, owing to its Doric court with colonnades set off by an orangery. Among the good paintings here are works by Rubens, Titian, and portraits by Van Dyck. The city owns the Villetta di Negro, with its artistic pleasure gardens and fountains. It contains the municipal museum and zoölogical gardens. The Palazzo Doria was presented in 1522 to Andrea Doria (q.v.), 'father of his country,' and, as the Latin inscription on the building says, admiral of the Papal, Imperial, French, and Genoese fleets. The building was remodeled in 1529 by Montorsoli after plans suggested by Doria, and was at that time decorated with frescoes by Perino del Vaga, a pupil of Raphael. The interior of the little thirteenth-century Gothic Church of San Matteo was also remodeled by Montorsoli. The façade of the church bears inscriptions in honor of the Doria family; the sword of Andrea Doria hangs over the high altar, and his tomb is in the chapel. The thirteenth-century Palazzo Ducale, remodeled in the sixteenth century, and, after a fire, modernized in 1777, was once the residence of the doges; now it is given over to judges and police commissioners. The seventeenth-century Palazzo Reale acquired by the royal family in 1815, and restored in 1842, is magnificently furnished. In the Church of Santo Stefano is a celebrated painting by Giulio Romano, the "Stoning of Stephen."

In the Piazza Acquaverde, before the railway station, there is a marble statue of Columbus, who was born near or in Genoa. This monument, sculptured in 1862 by Canzio, has four allegorical figures—Religion, Science, Strength, and Wisdom. At the foot kneels a figure representing America. On the pediment of the Palazzo Faragiana, opposite, are scenes from the life of Columbus in marble relief. In the sixteenth-century Palazzo Municipale (City Hall) is a mosaic portrait of him, and in the pedestal of his bust are preserved the originals of some of his letters. There are also memorials of him in the Palazzo Bianco. He is said to have been baptized in the architecturally interesting Church of Santo Stefano. The Municipale possesses also Paganini's famous violin (Guarneri). Among the many monuments which enrich the spacious piazzas and corsos of Genoa are those of Victor Emmanuel and Mazzini, who was born here, and an immense bronze monument to the Duke of Galliera. The modern Campo Santo (cemetery) is beautifully laid out on the north bank of the Bisagno. It contains many splendid monuments, and is famous for its imposing appearance, crowning rotunda, and galleries with their striking variety of sculptured monuments. In the environs are several lordly and celebrated villas, and gorgeous views of sea and shore abound on every hand, as in the city itself.

The finest court and stairway in Genoa are in the Palazzo dell' Università, which was begun as a Jesuit College in 1623, and transformed into a university by Napoleon in 1812. The university

in 1900 counted 127 instructors (including docents) and 1330 students. Among the principal libraries are that of the university, the city library (in the Academy of Fine Arts), that in the Palazzo Rosso, the Missioni Urbane, and the Franconia. Genoa has two royal gymnasia, two royal lyceums, a theological seminary, a royal school of shipbuilding, a commercial school of university rank, five technical schools, three royal normal schools, two technical evening schools, a school of technical design, and the industrial school Duchessa Galliera. Genoa is not important in the realms of literature, music, and the theatre.

Among the splendidly equipped institutions of charity, to which the city grants over \$100,000 a year, are the Pammatone Hospital, with beds for 700, founded in 1420 by Bartolommeo Bosco; the poor-house, founded in 1655, and enlarged in 1835, with accommodation for 1400; the hospital for the incurable; the Sant' Andrea Hospital; the asylum for the deaf and dumb; the orphan asylum, with accommodation for 600 girls; the insane asylum; the asylum for the blind; the Protestant Hospital; and the children's hospital.

Of the seven principal theatres the most important—one of the largest in Italy—is the Teatro Carlo Felice, built in 1828, with 3000 seats. There are excellent electric-lighting, gas, telephone, water, and sewerage systems, and the death-rate has declined appreciably during the past generation. There is a paid fire department, with a per capita annual expenditure of over ten cents. The city government has a high reputation for efficiency. The administration consists of sixty municipal councilors elected by the citizens, forty lira of taxes entitling a citizen to a vote, and to nomination as a councilor. A giunta or administrative committee of twelve members is elected from among themselves by the council, and from this administrative committee the King appoints the syndic or mayor. Genoa is the seat of an archbishop.

There is regular communication by steamship with the principal Mediterranean ports; with Germany and the British Isles; with New York (weekly); and with Asia and Australia. The headquarters of the Navigazione Generale Italiana, and of other steamship companies, are here.

As a commercial centre Genoa is advancing rapidly, with the prospect of becoming before long the first port on the Mediterranean. The connections by rail with the Saint Gothard Tunnel, 200 miles north, render it the principal port on the Mediterranean for Switzerland and Germany. The East railway station in the city is connected with the main or West station by a subway a mile and a half long, which has a branch diverging to the harbor station. The harbor station is connected with the various docks by rail.

In 1900 the imports amounted to 3,075,790 tons (metric), and were valued at 519,079,519 lira (about \$100,000,000); the exports amounted to 232,300 tons, valued at 240,106,592 lira (about \$47,000,000). The principal article imported is coal from England; in 1900, 1,855,857 tons, which is more English coal than is imported by any other port in the world. In 1891 the value of the imports was about \$78,000,000, of the exports about \$18,000,000; in 1877 the imports were valued at \$58,000,000, exports at about \$9,500,000. The weight of the goods that passed through Genoa in bond in 1900 was 367,534 tons;

their value 155,564,373 lira (about \$30,000,000). The number of vessels entering and clearing in 1900 was 13,602 (7292 steamships), with registered tonnage of 9,727,545. In nationality, 9770 were Italian, 1398 English, 453 German, 426 French. The number of vessels entering and clearing in 1891 was 12,256, with registered tonnage of only 6,421,637. Of these only 5973 were steamships. In the seventies the number of vessels entering and clearing averaged only 5000, with tonnage of about 2,000,000. In point of tonnage Genoa is by far the first of Italian cities, though in 1900 it was still surpassed by Naples in number of vessels entering and clearing. The principal imports besides coal are grain (in 1900 about \$16,000,000), cotton (about \$16,000,000), silk (about \$7,000,000); the principal exports are silk goods (in 1900 about \$15,000,000), cotton goods (about \$8,000,000), spirits, wine and oil (about \$4,000,000). American cottonseed oil is mixed here in large quantities with olive oil, and exported. The industrial interests are also important.

The manufactures are velvet and silk fabrics, woolen goods, cotton goods, ribbons, damask, embroidery, artificial flowers, hats, paper, leather and leather goods, furniture, objects in gold, silver, ivory, marble, alabaster, and coral, essences, soap, preserved fruits, chocolate, macaroni, and vermicelli. San Pier d'Arena (q.v.), the most important suburb of Genoa, is a manufacturing centre. Population, in 1881, 179,515; in 1901, 234,710.

In ancient, as well as in mediæval times, Genoa was an important seaport. It was conquered by the Romans in B.C. 222 and made part of Gallia Cisalpina. At the time of Augustus Genoa was, according to Strabo, "a flourishing town and the chief emporium of the Ligurians." During the Dark Ages Genoa, with different barbarian overlords, maintained in greater part its municipal organization. In 936 it was plundered by the Saracens, against whom it had been a bulwark of defense for the whole of Liguria. Then Genoa and Pisa formed an alliance to expel the Saracens from the strongholds of Corsica and Sardinia. This being effected, the Genoese obtained, by Papal arbitration, the grant of Corsica, while Sardinia was assigned to the Pisans. For the next two centuries the two cities were almost continually at war, until in 1284 in the naval battle of Meloria the Genoese broke the power of Pisa. Meanwhile the Genoese had vigorously co-operated in the Crusades, and as material reward, had obtained important commercial privileges in the Holy Land. The city had also established settlements at Constantinople, in the Crimea, in Syria, Cyprus, Tunis, and Majorca, and rose to such a height of maritime power throughout the Mediterranean that the natural sequence was a 140-year struggle with Venice, which terminated in the Peace of Turin (1381), decidedly disadvantageous to Genoa.

During both the Pisan and the Venetian wars, internal dissensions had weakened the city and occasioned changes in the form of government. In 1190 the consuls were superseded by a podestà (q.v.), an office which lasted till 1270, when two of the great Guelph leaders of the State resolved to subvert the popular authorities, and, under the title of 'captains of liberty,' assumed irresponsible authority, which for twenty-one years they contrived to retain. During their sway civil feuds

continued to rage. Various other modifications of the government preceded the election of the first Genoese Doge in 1339. This supreme magisterial office, which was held for life, and from which nobles were excluded, continued for two centuries.

The ambitious contentions of four leading democratic families—viz. the Adorni, the Fregosi, the Guarci, and the Montaldi—succeeding those of the patrician houses of Doria, Spinola, Grimaldi, and Fieschi, engendered such disastrous civil strife under the early doges that, in 1396, the citizens invoked the protection of the French King Charles VI., and finally submitted to the rule of the Visconti (q.v.), the lords of Milan, in 1464. After the invasion of Louis XII., in 1499, Genoa was subject to the French till 1528, when the genius and resolution of a great citizen, Andrea Doria (q.v.), freed his country from foreign invaders, and restored to Genoa republican institutions. But the power of Genoa was on the wane. The Turks seized her Oriental possessions, the French bombarded the city in 1684, and the Imperial troops occupied it for a brief time in 1746. In 1736 the Corsicans, who had for seven years been in rebellion, chose a Westphalian nobleman named Neuhoof (q.v.) as their King. He was soon expelled by the Genoese with the aid of the French, who in 1768 bought the island. During the French Revolution, when the French swept over Italy, Genoa sought to remain neutral, but, being threatened by the English under Nelson, finally joined France, and made a money contribution of 2,000,000 francs. Then a democratic uprising favored by Napoleon put an end to the sway of the nobility. In 1797 a democratic constitution was adopted, and the Ligurian Republic established. In 1800 the French general Masséna was besieged in Genoa by the Austrians and English and forced to capitulate. In 1805 Napoleon annexed the Ligurian Republic to the French Empire. After the fall of Napoleon, Genoa was, against her will, awarded by the Congress of Vienna to the Kingdom of Sardinia (q.v.). Consult Malleon, *Studies from Genoese History* (London, 1875).

GENOA, GULF OF. The portion of the Mediterranean, near the Italian city of Genoa, which is partially inclosed by the coast that winds from Spezia west to Oneglia (Map: Italy, C 3).

GENOUDE, zhá'nōd', ANTOINE EUGÈNE (1792-1849). A French publicist, born at Montélimar (Drôme). At first a student of eighteenth-century philosophy, he became an ardent Catholic, and threw himself into all the controversies of the period, hailing the return of the Bourbons with enthusiasm. He was, with Lamennais, the founder of *Le Défenseur* (1820), which was replaced by *L'Etoile* (1821), the Government organ, and revived the old *Gazette de France* (1825). After the Revolution of July (1830) he attacked the new party with much vigor. In 1835, the year following the death of his wife, he took orders. His active career ended in 1848. His works include: *Voyage dans la Vendée et dans le midi de la France* (1820); *La raison du christianisme* (1834-35); and *Les pères de l'église des trois premiers siècles* (1837-43).

GENOUILLERE, zhá'nō'yár' (Fr. knee-piece). A term in fortification (q.v.), denoting that part of the interior slope of the parapet which serves as a cover for the lower part of a gun-carriage. The term itself is derived from one

of the articulated pieces of metal used in suits of armor. In the thirteenth century it was a knee-piece of beaten metal (iron) held in place by a leather bandage or strap; but subsequent improvements made it much more pliable, and added (in the fourteenth century) large rings which projected rearward on each side of the knee-joint.

GENOVESI, já'nô-vá'sé, ANTONIO (1712-69). An Italian writer on philosophy and political economy. At an early age he was destined by his father for the Church, and began the study of theology in a monastery. He took orders and was appointed to the chair of rhetoric in the theological seminary of Salerno. He now read with eagerness the works of the chief modern philosophers, and was particularly attracted by Locke. Dissatisfied with ecclesiastical life, Genovesi resigned his post at Salerno, and proceeded to Rome, where he undertook the study of law, and qualified as an advocate. The details of legal practice, however, proved as distasteful as theology, and for some years he gave himself up entirely to the study of philosophy, attending most of the distinguished lectures at the university at Naples. At this place, after having obtained the appointment of professor extraordinary of philosophy, he opened a seminary or private college for students. His reputation as a teacher was increased by the publication in 1743 of the first volume of his *Elements of Metaphysics* and in 1741 of his *Logic*. Both works are imbued with the spirit and principles of the Empirical School of philosophy. On account of the accusation of infidelity and heresy excited by his discussions of metaphysical principles, he had some difficulty in obtaining the professorship of moral philosophy, and failed in his effort to be appointed to the chair of theology. He published a continuation of his *Elements of Metaphysics*; but with every new volume he experienced fresh opposition from the partisans of scholastic routine. In spite of this Genovesi obtained the approbation of Pope Benedict XIV., of several cardinals, and of most of the learned men of Italy. Among them was Intieri, a Florentine, who founded, at his own expense, in the university at Naples, the first Italian chair of political economy, under three conditions, namely: that the lectures should be in Italian, that Genovesi should be the first professor, and that, after his death, no ecclesiastic should succeed him. He was one of the first in Italy who dared to write upon philosophy in the common language of the country. His *Opere scelte* were published in 4 vols. (Milan, 1835).

GENRE, zhǎn'r' (Fr., sort) **PAINTING.** A term used in art to denote that class of subjects which portray the intimate and every-day life of any people. This draws the line sharply between this class of subjects and historical painting, which depicts more or less great moments of national life. This class of painting is characteristic of the Dutch school by which it was first largely practiced. Its chief masters in that school were Terburg, Brower, Ostade, Rembrandt, the younger Teniers, Metz, Gerard Dow, Frans Hals, and others. Their subjects were the familiar life of the family; street scenes and sports; festivals and picnics, tavern scenes—all that goes to make up the occupations of a people. These might be comic, serious, or pathetic, but

genre painting, strictly speaking, always includes as a dominant note the human element. Pictures of this class are usually of small dimensions, but they are always valuable and interesting records of contemporary life. In British art Wilkie and Hogarth are prominent examples of genre painters. Hogarth was probably the greatest master in English genre painting and his pictures portraying the weaknesses and follies of the life of his time are powerful parables, and full of artistic strength. Genre work was done in Spain by Velazquez and Murillo, and in France, during the eighteenth century, by Watteau, Greuze, and others. There was a general revival of this kind of subject during the nineteenth century, and among the many painters of all nations who have practiced it we need only mention such names as Meissonier in France, Fortuny in Spain, Kraus, Defregger, and Grützner in Germany. See DEFREGGER; GRÜTZNER; MEISSONIER.

GENS (Lat., race). A word sometimes used by the Romans to designate a whole community, the members of which were not necessarily connected by any known ties of blood, though some such connection was probably always taken for granted. In this sense we hear of the *gens Lattiorum*, *Campanorum*, etc. But it had a far more definite meaning than this in the constitutional law of Rome. According to Scævola, the pontifex, those alone belonged to the same *gens*, or were 'gentiles,' who satisfied the four following conditions: (1) Who bore the same name; (2) who were born of freemen; (3) who had no slave among their ancestors; and (4) who had suffered no *capitis diminutio* (reduction from a superior to an inferior condition). In the identity of name, some sort of approach to a common origin seems to be implied. The *gens* thus consisted of many families, but all these families were supposed to be more or less nearly allied by blood.

The Roman form of organization is found among all races and in every part of the world, and is now known generically, by the common consent of ethnologists, as the clan (q.v.), although in literature and in history *gens* is the familiar term. The clan is a body of kindred wider than a family or household, and narrower than a tribe (q.v.), and recognizing relationship, together with the right to names and to property, in one line of descent only, through the mother, but not through the father, or through the father, but not through the mother. The primitive clan, found in savagery and the lower stages of barbarism, is a totemic group (see TOTEMISM), or 'totem kin.' Its members hold sacred some species or variety of plant or animal, regarded as female in sex, and claim to be descended from it. Such are in many cases the clans of the Australian aborigines and of the North American Indians. Clans thus tracing descent through the mother are called matrilineal; while the clans found in a higher stage of social evolution, as among the Arabs, the Greeks, and Romans, and the Slavs, Celts, and Teutons at the dawn of European history, in which descent is reckoned through fathers, are called patrilineal. The Greek *génos*, and its equivalent form the Roman *gens*, were highly developed patrilineal clans. The discovery that the totemic organization of the North American Indians was in all essentials like

the Roman *gens*, except in being matrilineal, was made by Lewis H. Morgan. From this discovery to that of the practical universality of the clan as the characteristic social form of tribal communities was but a step, and the wider generalization was offered by Morgan in his *Systems of Consanguinity and Affinity*. The functions of this clan are economic, religious, and juristic. It usually holds common property, and a burial-place. It regulates marriages; in the primitive clan the clansman may not marry his own clanswoman. This restriction was breaking down in the Roman *gens* at the beginning of the authentic historic period. All clansmen were bound to defend one another, and to redress one another's injuries. In Morgan's writings the word *gens* is everywhere used for clan, and his use of *gentile* to distinguish tribal from civil society has been usually followed.

GENSAN, gèn'sân'. See WON-SAN.

GEN'SERIC (?-477). King of the Vandals. He was an illegitimate son of Godigisidus, who led the Vandals into Spain. After the death of his brother Gonderic, Genseric became sole ruler. In the year 429 he invaded Africa, on the invitation of Boniface, Count of Africa, the viceroy of Valentinian III., Emperor of the West, who had been goaded on to rebellion through the machinations of his rival Aëtius. Genseric's army at first amounted to 50,000 warriors. As they swept through Mauritania, the Kabyle mountaineers and the Donatist heretics swelled the horde, and more than equalled their associates in acts of cruelty and bloodthirstiness. The friends of Boniface, astonished that the hero who alone had maintained the cause of the Emperor and his mother Placidia during their exile and distress should have been guilty of such a crime, attempted, with ultimate success, to bring about an interview between the Count of Africa and an agent of the Empress. The army he hurriedly collected to oppose the Vandals was twice defeated by Genseric, and he was compelled to retire to Italy, where he was soon afterwards slain by Aëtius. All Africa west of Carthage fell into the hands of Genseric, who shortly after seized that city itself, and made it, A.D. 439, the capital of his new dominions. He also took possession of part of Sicily, Sardinia, and Corsica. In the year 451 he encouraged Attila to undertake his great expedition against Gaul. Tradition states that, at the request of Eudoxia, the widow of Valentinian, who was eager for revenge upon her husband's murderer, Maximus, Genseric in the year 455 marched against Rome, which he took, and abandoned to his soldiers for fourteen days. On leaving the city he carried with him the Empress and her two daughters, one of whom became the wife of his son Huneric. The Empire twice endeavored to avenge the indignities it had suffered, but without success. First the Western Emperor, Majorian, fitted out a fleet against the Vandals in 457, which was destroyed by Genseric in the bay of Carthage; second, the Eastern Emperor, Leo, sent an expedition under the command of Heraclius and others in 468, which was also destroyed off the city of Bona. Genseric died in 477, in the possession of all his conquests, leaving behind him the reputation of being the greatest of the Vandal kings. He seems to have regarded himself as a 'scourge of God.' In creed Genseric was a fierce Arian, and in-

flicted the severest persecutions upon the orthodox or Catholic party.

GENSFLEISCH, gän's'flish. See GUTENBERG, JOHANNES.

GENSICHEN, gën'sik-en, OTTO FRANZ (1847—). A German author, born at Driesen, Prussia, and educated at Berlin. After an association as dramaturgist with the Wallner Theatre, in Berlin (1874-78), he devoted himself exclusively to literary work. His principal publications include: *Gedichte* (2d ed. 1871); *Vom Deutschen Kaiser*, 12 poems (4th ed. 1871); *Felicia*, an epic (16th ed. 1882); and several novels in verse and prose. He also published the memoirs entitled *Aus Marie Seebachs Leben* (1900).

GENSONNÉ, zhän'só'ná', ARMAND (1758-93). A French legislator, born at Bordeaux. He was the author of the law of December 31, 1791, whereby the brothers of the King and several members of the aristocracy were publicly accused. The decree of confiscation against the property of the emigrants (February 9, 1792) was also drawn up by him. He subsequently was made president of the National Convention, but afterwards was accused of treason (October 3, 1793) and was executed with his associates. He was a man of high character and a highly effective speaker.

GENTH, gënt, FREDERICK AUGUSTUS (1820-93). An American analytical chemist and mineralogist, born at Wächtersbach, Hesse. He was educated at Heidelberg, at Giessen under Liebig, and at Marburg under Gerling in physics, and in chemistry under Bunsen, whose assistant he was from 1845 to 1848, when he went to Philadelphia and set up an analytical laboratory. In 1872 he was appointed to the chair of chemistry in the University of Pennsylvania, but resigned in 1888, and again opened his laboratory. He established twenty-three new minerals; wrote one hundred and two articles, mostly on chemistry and mineralogy; and was best known for his *Researches on the Ammonia-Cobalt Bases*, with Wolcott Gibbs (1856); for his studies of "Corundum" (in *American Philosophical Society Proceedings*, 1873); for his reports, as chemist and mineralogist to the Geological Survey of Pennsylvania, on the mineralogy of the State; and for his analyses for the State Board of Agriculture. He was a member of the American Philosophical Society (1854-93), one of the founders of the American Chemical Society, and its president in 1880, a member of the National Academy of Sciences and a fellow of the Boston Academy of Arts and Sciences.

GENTIAN, jën'shan (Lat. *gentiana*, Gk. γέντιανη, *gentianē*, said to have been named after an Illyrian king, defeated by the Romans about B.C. 160, *Gentius*, Gk. Γέντιος, who first discovered the properties of the plant). A genus of plants of the order Gentianaceæ. The species are numerous, natives of temperate and boreal parts of Europe, Asia, North and South America, and New Zealand, many of them growing in high mountain pastures and meadows, which they adorn by their beautiful blue or yellow flowers. The common gentian or yellow gentian (*Gentiana lutea*) is abundant in the meadows of the Alps and Pyrenees at elevations of 3000 to 6000 feet. It has a stem three or four feet high,

ovate-oblong leaves, and numerous whorls of yellow flowers. The part employed in medicine is the root, which is cylindrical, ringed and more or less branched, and which appears in commerce in a dried state, in pieces varying from a few inches to more than a foot in length, and from half an inch to two inches in thickness. It is collected by the peasants of the Alps. Although gentian-root has been examined by various chemists, its constituents are not very clearly known; it contains, however, gentiopicrotin, gentisic acid, pectin, fixed oil, and sugar. As much as 14 per cent. of the last is present, and in consequence of it an infusion is capable of undergoing fermentation and of forming the 'bitter snaps' or 'Enziangeist' which is much employed by the peasants on the Swiss Alps. Gentian is a highly valued medicine, a simple tonic, bitter without astringency, and is much used in diseases of the digestive organs, and sometimes as an anthelmintic. The bitter principle on which its virtue depends exists in other species of this genus, probably in all, and appears to be common to many plants of the same order. The roots of inferior quality of the species *Gentiana purpurea*, *Gentiana punctata*, and *Gentiana pannonica* are often mixed with the gentian of commerce. Among the most common European species are *Gentiana campestris* and *Gentiana Amarella*, plants of a few inches in height, with small flowers, both of which are in use as tonics in domestic medicine. *Gentiana Saponaria*, a North American species, is extensively used in its native country as a substitute for common gentian, and *Gentiana Kurroo* is employed in the same way in the Himalayas. Several species of gentian are common ornaments of gardens, particularly *Gentiana acaulis*, a small species with large blue flowers, a native of the countries of Europe and of Siberia, often planted as an edging for flower borders. *Gentiana Andreuxii* and *Gentiana puberula*, American species, the former known as closed gentian or bottle gentian from the non-opening of the flowers, and the latter with blue, funnel-shaped flowers, are common in American gardens. Of the fringed gentian species *Gentiana crinita* is particularly celebrated for the beauty of its flowers, which are large, blue, and fringed on the margins. It has a branched stem and grows in wet ground. The brilliancy of the flowers of the small Alpine species has led to many attempts to cultivate them, which have generally proved unsuccessful, apparently from the difficulty of imitating the climatic and soil conditions of their native heights. The horse-gentian is *Triosteum perfoliatum*. See FEVERWORT, and Colored Plate of MOUNTAIN PLANTS.

GENTIANACEÆ, jën'shan-ä'sé-ë (Neo-Lat. nom. pl., from Lat. *gentiana*, gentian), the gentian family. An order of dicotyledonous plants, most of which are herbaceous, though a few are small shrubs. Many of the herbaceous species are perennial from a rhizome. The leaves are, for the most part, opposite, and without stipules. The inflorescence is some form of cyme, and the flowers are usually regular. The calyx is 5, sometimes 4, 6, 8, or 10 parted. The corolla, which is hypogynous, has the same number of lobes as the calyx. The stamens are of the same number as the corolla-lobes and the ovary, which consists of two carpels, and contains numerous small seeds. The family embraces about 60

genera and more than 700 species. Species of this order are found in nearly every part of the globe, and in all sorts of situations. Some are arctic and alpine plants, some are saprophytes, some grow in dry situations, others in marshes, while the species of one genus are aquatic in habit. The flowers of many are of great beauty both as to color and form, and some are cultivated as ornamentals. Medicinal properties are attributed to some. The genera of this order have been variously grouped dependent upon the characters used, one of the latest classifications being based upon pollen characters. The chief genera are: *Gentiana*, *Erythraea*, *Chlora*, *Swertia*, *Menyanthes*, *Limnanthemum*, and *Voyria*. See BUCKBEAN; GENTIAN; CENTAURY.

GENTILE DA FABRIANO, jën-tê'lâ dâ fâ'brê-â'nô (c.1360-c.1428). An Italian painter, called Fabriano from his birthplace (Fabriano, in the March of Ancona). He belongs to the early Umbrian and Sienese schools, was the pupil of Allegretto Nuzi, and has also been called the pupil of Fra Angelico, but this is not probable. He painted in Brescia, Siena, but chiefly in Florence (1421-25), and then went to Orvieto. In 1426 he executed paintings for Pope Martin V. in the Church of San Giovanni in Rome, and other works, all of which have been destroyed. His extant pictures include a "Coronation of the Virgin," portions of which are at the Brera in Milan; and the centre panel at Fabriano, the "Adoration of the Magi," his masterpiece, most of which is in the Accademia di Belle Arti at Florence, the remainder, a "Presentation," in the Louvre, Paris. There are also a "Holy Family" in the Louvre; some scenes from the life of Christ in the Berlin Museum; and a "Crucifixion" in San Agostino de Bari. His beautifully studied pictures sparkle with gold and colors like jewels. His figures are always animated and his faces smiling, wherever they appear. He belongs to the transition period of the fifteenth century. Although he clung to primitive methods of painting, in technical knowledge he went beyond the artists of his time. Jacopo Bellini was the pupil of Fabriano, and worked with him in Florence.

GENTILES (Lat. *gentilis*, belonging to a clan, or family, from *gens*, tribe, family). A term often used in the Bible, especially in the New Testament, to designate the non-Israelitic peoples. It represents the Hebrew *goyim* (pl. of *goi*), 'nations.' The peculiar significance of the term Gentile in Jewish and early Christian usage simply marks the crystallization of a long previous process of doctrinal development.

Prior to the conquest of Canaan, Israel's life was of a strictly tribal character, and in accordance with the common Semitic ideas the tribes constituting Israel probably felt that they differed from other tribes or peoples only in the fact that they worshiped their God, Yahweh, while the other peoples worshiped their particular deities. Hence in the old stories of the patriarchal age there is manifest no special hostility or attitude of superiority toward the surrounding nations.

The occupancy of Canaan and the development of a vigorous Hebrew nationality after a long struggle with the old inhabitants and with outside nations led to a new and more positive national consciousness. Israel was now a people (Heb. *'am*), Yahweh's people, one of the *goyim*

of the earth, ready to assert its peculiar rights and privileges.

The historical narrative pointed out how Israel was specially called of Yahweh to be His own peculiar people, and the legislation defined the legal status of foreigners residing in the borders of Israel. The early Hebrew law distinguished two classes of such non-Israelites—the *ger*, i.e. sojourner, a permanent resident and in sympathy with Israel's life, and the *zar* or *nokri*, i.e. the stranger or foreigner, who was not looked upon so favorably. As to the *ger*, the law required of him obedience to the Sabbath law, and provided that he was not to be vexed or oppressed. He could also present an offering to the priests, which was not allowed to the *nokri* (Lev. xxii. 25).

In the prophetic teaching (c.750 B.C. to the Exile) the contrast between Israel and the nations (*goyim*) is most forcibly expressed. Israel's place is unique, and while Yahweh's gracious attitude toward other nations is fully asserted, still it is through Israel that such blessings are to come to them. With this advocacy of Israel's peculiarly exalted position the prophets also insisted on the open-hearted favorable treatment of the sojourners in Israel required by the older laws.

The legislation in Deuteronomy, influenced by prophetic thought and the teachings of Ezekiel, and the later priestly legislation of the Pentateuch reveal the growth of the tendency to draw the lines more rigidly between the Israelites and the foreigners. As a result we have such teachings as these: The *ger* and *nokri* may eat that which dies of itself (Deut. xiv. 21); the *nokri* is not entitled to the privilege of the year of release (xv. 3); no *nokri* has a right to the throne of Israel (xvii. 15); one may lend on interest to the *nokri* (xxiii. 20). Furthermore, not only could no *nokri* make an offering, but he also could not enter the sanctuary (Ezek. xlv. 7, 9), nor eat of the Passover (Ex. xii. 43). If a *ger* desired to eat of the Passover, he must be circumcised, and thus become legally a full Israelite (Ex. xii. 48).

Such principles as these, which were the fundamental law of the Jewish communities of exilic and post-exilic time, show how at last the conviction became deeply rooted and clearly expressed that Israel was, theoretically, a holy entity, a people by itself, altogether unique among the peoples of the earth. The other peoples, the *goyim*, were *per se* profane. The Israelite could not meet them as equals. The work of Ezra and Nehemiah was of great influence in this respect. Henceforth the attitude toward the non-Israelite manifested two marked phases. On the one hand was the insistence on the idea of separation, of exclusiveness, under all circumstances, so that the Jew, not only in Palestine, but also in the Dispersion, scattered among the Gentiles, was ever a Jew, holding himself aloof from intimate familiar intercourse with the non-Israelite, with a lofty contempt for Gentile ideas and customs. These feelings were the more intensified by the bitter struggles of the Maccabean times, and were shared by the great majority of Jews, even of the humble classes, in New Testament times (cf. Acts x. 28). Practically, violations of these principles were constantly occurring. There were certain limits,

however, which no Gentile could ever overstep, e.g. the prohibition in the Temple of Herod marking off the court of the Gentiles from the precincts in which Israelites were allowed, reading as follows: "No foreigner may enter within the railing and fence about the sanctuary. Whoever is caught so doing renders himself guilty, for death follows."

On the other hand, the early and prophetic teachings, and the legal sentences recommending kindness to the *ger* and emphasizing Yahweh's care for the nations, coupled with the conviction that as a Jew he possessed in his Scriptures the only satisfactory all-sufficient revelation, all combined to make the Jew willing, even anxious, to win over the foreigners with whom he was in contact, to adhesion to Judaism. Hence arose the practice of proselyting. In later Jewish usage the word for proselyte was the old word *ger*, which indicated the most favorable status of the foreigner. The Maccabean princes compelled conquered peoples—the Idumæans, for example—to become Jews, i.e. be circumcised. But more usually these efforts were carried on privately and with astonishing success, when we remember the almost universal contempt for Jews among the cultivated Greeks and Romans. Strictly speaking, there was but one class of proselytes—those who fully accepted Judaism, and, if males, became circumcised. These were called in later rabbinical literature 'proselytes of righteousness.' Others, who did not fully embrace Judaism, but were favorably disposed toward it, and accepted many of its doctrines and practices, were held in high esteem in the Jewish communities.

In the early Church the relation of the Gentiles to Christianity became a most important question—were they to be received mediately, through Judaism, and thus become Christian Jews, or immediately accepted into the Christian brotherhood without being required to be circumcised and obligated to keep the Jewish law? While many early Christians took the former position, Paul advocated the latter, and thus broke down the barrier between the religion of Yahweh and the Gentile world.

GENTILESCHI, jën'të-lës'kë. A family of Italian painters. ORAZIO (1563-1647), the father, was born at Pisa. He was also called Lomi, being a pupil of his half-brother and uncle by that name. At Rome, in conjunction with Agostino Tassi, a landscape painter, he decorated the interiors of a number of palaces. In 1621 he went to Genoa, where he painted "David after the Death of Goliath" in the Palazzo Doria. He visited England in 1626, where he secured the patronage of Charles I. and was himself painted by Van Dyck in his series of portraits of illustrious men. Among his best works are "Saints Cecilia and Valerian" in the Palazzo Borghese, Rome; "Joseph and Potiphar's Wife" at Hampton Court; "Moses Saved from the Waters" in the Madrid Museum. He died in London.

His son FRANCESCO assisted his father in England, but of his work little is known.—ARTEMISIA GENTILESCHI, the daughter of Orazio, born at Rome, in 1590, studied under her father and Guido Reni. She accompanied her father to England and, in the opinion of Horace Walpole, excelled her parent in portraiture. Her "Judith and Holofernes," a subject which she often re-

peated, is in the Florence Gallery. Among her other works are "Women Caressing Pigeons," in the Madrid Museum; portrait of herself in Hampton Court, and in the New York Historical Society is her painting "Christ Among the Doctors."

GENTILESSE, jën'ti-lës'. A poem of Chaucer's which has been preserved as the fifteenth to seventeenth stanzas of "a morale balade of Henry Scogan, Squyer." The latter has been printed *in toto* in all editions of Chaucer's works from Caxton to Skeat, but the interpolation was pointed out long ago by John Shirley, the fifteenth-century copyist. Skeat was the first to print Chaucer's part of the poem separately. The poem was originally addressed to 'the Lordes and Gentilmen of the Kinges house.' Scogan was an admiring fellow-poet and disciple of Chaucer's.

GENTILI, jën-të'lé, ALBERICO (1552-1608). An Italian-English jurist, born at Sangenesio (Ancona). He received the degree of doctor of law from the University of Perugia. Because of his Protestant views he was forced to leave his native town and to flee to Carniola, and finally to England, where he was appointed lecturer on Roman law at Oxford, and afterwards regius professor of civil law there. So great was his reputation that he was consulted by the Government when Mendoza, the Spanish ambassador, was found to be plotting against Elizabeth (1584). His book *De Legationibus Libri Tres* (1584) discusses this subject. He also wrote *De Jure Belli Libri Tres* (1598), a collection of disputations on the law of war. In 1605 he was made standing counsel for the King of Spain. The notes he made while acting in this capacity were published posthumously, under the title *Hispanice Advocacionis Libri Duo* (1613). Gentili is considered to have rendered valuable services to international law, and Grotius is said to be indebted to him for much that is valuable in his own writings.

GENTILLY, zhän'të'yé'. A town of France, situated in the metropolitan Department of Seine, about two and one-half miles south of Paris (Map: France, C 7). The great bastioned wall of Paris passes through the town, separating it into two portions, called Great and Little Gentilly. The parish church dates from the thirteenth century. There are extensive chemical works, potteries, and tanneries. Population, in 1901, 7433.

GENTLE. A maggot. See FLESH-FLY.

GENTLEMAN (OF., Fr. *gentilhomme*, ML. *gentilis homo*, man of breeding, from Lat. *gentilis*, relating to a family, from *gens*, family, and *homo*, man). Originally, a person whose kindred was known and acknowledged; which is the sense in which it is still employed when it is not intended to make any reference to the moral and social qualities of the particular individual. One who was *sine gente*, on the other hand, was one whom no *gens* acknowledged, and who might thus be said to be ignobly born.

The term gentleman is often confounded with esquire (q.v.), but they are not equivalent, and the former seems in England, from a very early time, to have been a mere social epithet. But even in the beginning of the seventeenth century the word was still held to have a stricter mean-

ing, in which it was more nearly synonymous with the French *gentilhomme*, as denoting those whose blood and race were noble and known. Even here, however, it scarcely seems that any connection with a titled family was considered necessary to confer the character, for it is described as corresponding, not to nobility, in the English sense, but to *nobilitas*, in the Roman sense, and as resting on "old riches or powers remaining in one stock." There can be no doubt that, in still earlier times, patents of gentility were granted by the King of England. There is one still in existence by Richard II. to John de Kingston, and another by Henry VI. to Bernard Angevin, of Bordeaux. These patents corresponded to the modern patents of arms which are issued by the heralds' colleges in England and Ireland, and by the Lyon office in Scotland, and were probably given on the payment of fees. A patent of arms confers the rank of esquire, and there probably is no other legal mode by which an untitled person can acquire it, unless he be the holder of a dignified office. The phrase, however, is loosely applied to all persons who have not themselves 'risen from the ranks,' or in a still less limited sense to those who, whatever their origin, display the qualities associated with 'gentle' birth.

GENTLEMAN DANCING-MASTER, THE. A comedy by Wycherley (1671). The plot is chiefly concerned with the schemes of a daughter and her lover—disguised as a dancing-master—to escape the vigilance of her father, a city merchant who affects the Spanish Don.

GENTLEMAN GEORGE. A sobriquet of George IV. of England. It was also used of Senator George H. Pendleton of Ohio, because of his courtesy in debate.

GENTLEMAN USHER, THE. A comedy by Chapman. It appeared in 1606, and contains several passages of much beauty and refinement.

GENTLEMEN-AT-ARMS. One of the body-guard of the British sovereign. Its full title is "His Majesty's Bodyguard of the Honorable Corps of Gentlemen-at-Arms." Instituted in 1509 by Henry VIII., and called "Gentlemen Pensioners," it received its present name in 1834. With the exception of the Yeomen of the Guard, it is the oldest corps in the British service. It is composed of a captaincy, the Gold Stick, value £1200 a year; a lieutenantcy, the first Silver Stick, £500; a standard-bearership, the second Silver Stick, £310; a clerkship of the check, £120; an adjutancy, a sub-officership, and forty memberships, £70 each. The corps does duty only at drawing-rooms, levees, and on important State occasions. The appointments are Crown gifts on the commander-in-chief's recommendation, and are given to military officers of service and distinction on half pay or retired full pay. The captaincy is vacated with each Ministry.

GENTLE SHEPHERD, THE. A pastoral drama by Allan Ramsay (1725). It concerns itself with the sentimental conversations of the peasants on a Scottish estate. The slim plot is furnished by the return in disguise of their long absent master, and by the loves of Roger and Patie. The play was elaborated from a poem of the author's called *Patie and Roger*, published four years earlier.

GENTLE SHEPHERD, THE. A nickname of George Grenville originating from a satirical aside of Pitt's during debate in the House. In considering the advisability of an additional duty on cider, Grenville bewailed in languid utterance the increase of taxes after the late war, and demanded *where* they could now be laid. Not receiving an answer, he repeated the inquiry; and Pitt responded softly in the words of the old song: "Gentle Shepherd, tell me where."

GENTOO'. A corruption of the Portuguese *gentio* (gentile, heathen), formerly used to designate various Hindu and Dravidian-Kolarian peoples of India, the Telugu, or Telingas, in particular.

GENTRY, MEREDITH POINDEXTER (1809-66). An American statesman. He was born in Rockingham County, N. C., and was chiefly self-taught. With a natural aptitude for oratory, he soon became widely known as a public speaker, and in 1839 was sent by his Whig constituents to the twenty-sixth Congress. Here he became distinguished for his frank and straightforward attitude in regard to the slavery question, his advocacy of the policy of receiving petitions for the abolition of slavery, and his strong speech favoring the restoration of exclusive patronage. He subsequently served in Congress as Representative from Tennessee from 1841 to 1843, from 1845 to 1847, and from 1847 to 1853. In 1862 and again in 1863 he was a member of the Confederate Congress, where, however, he was noted for his moderate policy. He was accounted one of the best informed men of his day on political history. One of his notable oratorical feats was an extempore eulogy of Henry Clay, which Alexander H. Stephens characterizes as 'apt, powerful, and pathetic.'

GENTZ, gents, FRIEDRICH VON (1764-1832). A German publicist, born at Breslau. He studied law at Frankfort and Königsberg, became in 1786 Secretary of the General Directory in the Prussian service, and in 1793 was made a Prussian war counselor. A disciple of Kant and of Rousseau, he at first looked with favor upon the revolutionary movement in France; but was converted by the course of the extremists, and by the influence of Burke, whose essay on the French Revolution Gentz translated in 1794, together with the writings of Mallet du Pan and Mounier (1794-95). He spent some time in England, and became a strong advocate of the English constitutional system. He founded two reviews, *Neue Deutsche Monatschrift* (1795-98), and the *Historisches Journal* (1799-1800). His presentation of his constitutional views in a letter to Frederick William III. on the latter's accession to the Prussian throne not being favorably received, Gentz entered the Austrian service as an Imperial counselor (1802). He was a bitter opponent of Napoleon, and advocated the coalition with England against France. In 1804 he wrote *Fragmente aus der Geschichte des politischen Gleichgewichts von Europa*, and he was the author of several of the proclamations directed against the French. After the Peace of Vienna, in 1809, Gentz dropped his liberalism, and became the facile instrument of Metternich's reactionary policy. He brought out, in 1818, a reactionary review, the *Wiener Jahrbücher der Litteratur*, and was the secretary of the Austrian plen-

potentaries at the Congresses of Vienna (1815), Aix-la-Chapelle (1818), Troppau, Laibach, and Verona (1820-22). For these services he received large pecuniary rewards, which he squandered in dissipation. He was a political thinker of some ability, and his classic and vigorous literary style made his services sought for; but he was always mercenary, and wholly lacking in fixed principles. He died at Vienna, June 9, 1832. His more important writings are contained in the collection edited by Weickz: *Ausgewählte Schriften* (5 vols., Stuttgart, 1836-38); in the *Kleine Schriften*, edited by Schlesier (5 vols., Mannheim, 1838-40); and in the *Mémoires et lettres* edited by Prokesch-Osten (4 vols., Vienna, 1873-74); also *Briefwechsel zwischen Friedrich Gentz und Adam Müller, 1800-29* (Stuttgart, 1857); and *Dépêches inédites du Chevalier de Gentz aux hospodars de Valachie 1819-28* (Paris, 1876). For his biography, consult: Schmidt-Weissenfels (Prague, 1859); Mendelssohn-Bartholdy (Leipzig, 1867); and Fournier, *Gentz und Cobenzl* (Vienna, 1880).

GENTZ, WILHELM (1822-90). A German genre and landscape painter, noted for his delineations of Oriental life and scenery. Born at Neu-Ruppin, Brandenburg, he turned from his studies at the University of Berlin to take up painting at the Academy and in the studio of Kloeber, then frequented the Academy of Antwerp, and from 1846 to 1852 studied with interruptions in Paris, first under Gleyre, later under Couture (1848 and 1853). In the meanwhile, he had traveled in Spain, Morocco, and Egypt, which he subsequently revisited five times, attracted magically by that Oriental world and scenery which he afterwards depicted with such consummate skill and brilliancy. Trips to Nubia, Asia Minor, Turkey, and Algeria followed later, after he had settled in Berlin in 1858, and begun the long series of his remarkable delineations of life in the Orient. His early pictures, biblical subjects with life-size figures, such as "Christ Among the Pharisees and Publicans" (1857, Chemnitz Museum), met with scant appreciation, and even his Oriental scenes worked their way to success only gradually, as their realistic treatment did not at first appeal to minds in which an ideal conception of the Eastern fairy world was deeply rooted. But the true merit of his faithful characterizations once understood, his fame grew apace with the appearance of each new picture, and he was deservedly ranked on a par with the foremost French artists in that line. Among his numerous paintings, in which figures and landscape are treated with equal mastery, the most prominent are: "Transportation of Slaves Through the Desert" (1860, Stettin Museum); "Prayer of Mecca Caravan" (1868); "Evening on the Nile" (1869); "Funeral Rites near Cairo" (1872, Dresden Gallery); "Meeting of Two Caravans in the Desert" (1873); "Entry of the Crown Prince of Prussia into Jerusalem, 1869" (1876, National Gallery, Berlin), one of his masterpieces, for which he made special studies in Palestine in 1873; "Market Scene in Algiers" (1879); "Memorial Service at Rabbi's Grave in Algiers" (1881, Leipzig Museum); "Palm Sunday in Early Christian Times" (1886); and "Evening on the Cataracts of the Nile" (1887). He also contributed illustrations to Ebers's *Egypt* and to some of his novels. He

was professor at the Berlin Academy, and since 1877 member of its senate.

GENUFLEXION (ML. *genuflexio*, from Lat. *genus*, to bend the knee, from *genu*, knee + *flexere*, to bend). The act of kneeling or bending the knees in worship. As an act of adoration, or reverence, there are frequent allusions to genuflexion in the Old and in the New Testaments; as Gen. xvii. 3, 17; Num. xvi. 22; Luke xxii. 41; Acts vii. 60; ix. 40; Phil. ii. 10. That the use continued among the early Christians is plain from the *Shepherd* of Hermas, from Eusebius's *History*, and from numberless other authorities; and especially from the solemn proclamation made by the deacon to the people in all the liturgies—"Flectamus genua" (Let us bend our knees); whereupon the people knelt, till, at the close of the prayer, they received a corresponding summons—"Levate" (Arise). It is worthy of remark, however, that in celebration of Christ's rising from the dead, the practice of kneeling at prayer, as early as the age of Tertullian, was discontinued throughout the Easter-time, and on all Sundays through the year. The kneeling posture was especially assigned as the attitude of penance, and one of the classes of public penitents in the early Church took their name, *genusflectentes*, from this circumstance. In the modern Roman Catholic Church the act of genuflexion implies the highest form of worship, and is frequently employed during the mass, as well as whenever persons enter or leave the church or pass in front of the altar on which the Blessed Sacrament is reserved; if it is publicly exposed, the genuflexion is made on both knees. In the Anglican Church the rubric prescribes the kneeling posture in many parts of the service; and this, as well as the practice of bowing the head at the name of Jesus, was the subject of much controversy with the Puritans.

GENUS (in biology). See CLASSIFICATION OF ANIMALS.

GENUS (in logic). See PREDICABLES.

GE'OCENTRIC (from Gk. γῆ, *gê*, earth + κέντρον, *kentron*, centre). A term used in astronomy to describe the motions and positions of the heavenly bodies such as they would appear to an observer at the earth's centre. See HELIOCENTRIC.

GE'ODES (Lat. *geodes*, sort of gem, from Gk. γεώδης, earthlike, from γῆ, *gê*, earth + εἶδος, *eidos*, form). Rounded hollow concretions, or indurated nodules, either empty or containing a more or less solid and free nucleus, and having the cavity frequently lined with crystals. They are sometimes called 'potato stones,' on account of their size and shape. The name seems to have been given them because they are occasionally found filled with a soft earthy ochre.

GEOD'ESY (from Gk. γεωδαισία, *geôdaisia*, art of mensuration, from γῆ, *gê*, earth + δαίειν, *daiein*, to divide). The science of the earth, its size, shape, and figure. The operations of the geodesist are primarily a mere extension of ordinary surveying (q.v.), so as to cover a greater extent of territory, and to increase the precision of observations. Furthermore, the geodesist makes use of astronomical methods to determine the latitudes and longitudes of various important points in his survey, in

order that maps and charts may be provided with their necessary reference lines. We may, therefore, define the objects of a geodetic survey thus: to determine accurately the relative positions of widely separated points on the earth's surface and the directions and lengths of the lines joining them, and to determine astronomically the absolute positions of widely separated points on the earth's surface. In the first case, the work simply supplies a skeleton of exact distances and directions on which to base a more detailed survey of the intervening country, as described under Topographic Surveying (see SURVEYING); in the second, the results furnish the data for computing the shape and size of the earth, in addition to their use in making more detailed surveys. In both cases the points determined form the vertices of a series of triangles joining all points of the system. One or more lines in this system of triangles and all of the angles are very carefully measured, and the lengths of all the other lines in the system are computed. The azimuths of certain lines are also determined, and, if desired, the latitudes and longitudes of all the points in the system and the lengths and azimuths of all the connecting lines. The work as a whole is denominated *triangulation*.

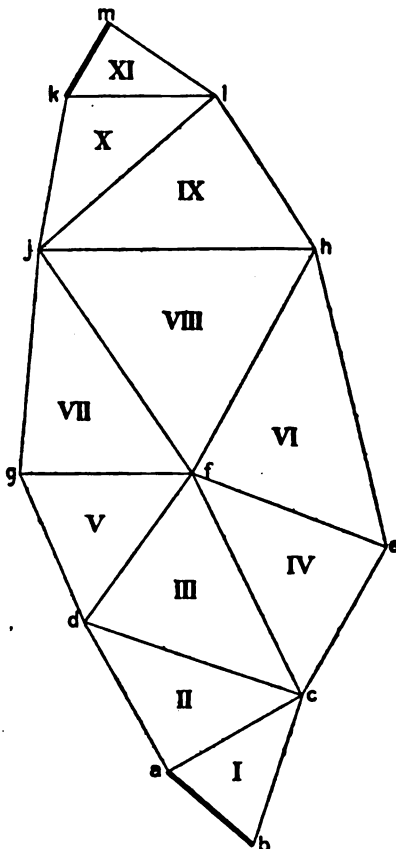


DIAGRAM OF A GEODETIC SURVEY.

Triangulation systems are of all degrees of magnitude up to the large primary systems covering entire continents, the single lines in which

are sometimes over 100 miles long. In making a triangulation survey, the first task is to select and measure a base line. This base should be located on nearly level ground, and its situation should be selected with special reference to the location of the triangles of the system. It is measured with extreme care by means of steel tapes and metal bars, careful allowances being made for temperature, sag, pull, etc., and the measurement being repeated several times to eliminate error. By these means it is common practice to reduce the error to from 1 in 100,000 to 1 in 1,000,000; measurements have been made in which the probable error was reduced to 1 in 2,000,000. In primary triangulation the length of base line employed is usually from three to ten miles; it is from two to three miles long for secondary triangulation, and from one-half to one mile long in testing triangulation. The base line, as ab in the figure, having been measured, a point c is selected upon some distant elevation which is visible from both its ends, and here a 'station' is erected which consists of a pole or target mounted on a tower to serve as an object on which to 'sight.' A theodolite is then set up first at a and then at b , and the angles at these points are measured by sighting on the station at c . From a , a sight is also secured on d , enabling the angle $c a d$ to be measured. The theodolite is then removed to c , back sights are secured on a and b , and fore sights on d , f , and e . Movement of the instrument is then made to d , e , f , etc., in succession and the angles measured. The first triangle abc , after the instrumental readings have been completed at each apex, is a triangle in which one side, the base line ab , and all the angles are known. From these known data the lengths of the two remaining sides ac and bc are easily calculated. The side ac being calculated gives the length of one side of the second triangle acd , of which the angles are determined by instrumental readings at the apices a , c , and d . Calculation gives the length of the side dc , which is also one side of the third triangle. By repetitions of the same process triangles IV to XI, inclusive, are calculated. Generally after the system of triangles has covered a distance, as from a to m , of from 200 to 600 miles, a second base line, as km , is measured and the survey is checked up by its means.

In primary triangulation the lengths of the sides of the triangles are so great that they cannot be used as a basis for a detached survey of a small tract within one of the triangles. For this reason the primary triangles I, II, III, etc., are subdivided by a system of secondary triangulation, and these secondary triangles are again divided into tertiary triangles. The specific methods of triangulation used by the United States Government Surveys are described under Topographical Surveys, in the article SURVEYING. It may be mentioned further here that the three great surveying organizations of the Government, the Coast and Geodetic Survey, the Engineer Corps of the Army and its allied commissions, and the Geological Survey, are all engaged in extending systems of primary triangulation upon which to base their detached surveys. The Coast and Geodetic Survey has already carried a chain of triangulation around the entire coastline of the United States as a base for its charts. It has also extended a system of triangulation of the greatest geodetic refinement into several

coastal States and a great belt of transcontinental triangulation connecting the Atlantic and Pacific coasts. The Engineer Corps has extended a system of triangulation around the entire shoreline of the Great Lakes and throughout the lengths of the Missouri and Mississippi rivers. The Geological Survey has extended the work of the Coast Survey and the Engineer Corps into the interior of a considerable portion of the country. Several of the States, and particularly New York and Massachusetts, have triangulated much of the area within their boundaries.

The important general problems of geodesy relating to the earth's figure are also receiving much attention. The civilized governments of the world have formed an International Geodetic Association which meets annually. Delegates attend from the geodetic departments of the several nations, and their joint deliberations make possible a concerted attack upon large problems, and give the benefits of coöperation. At the same time duplication of work can be avoided.

Some important works on geodesy are: Clarke, *Geodesy* (London, 1888); Hagford, *Geodetic Astronomy* (New York, 1898); Merriman, *Geodesy* (New York, 1899); Wright, *Adjustment of Observations* (New York, 1884); Jordan, *Handbuch der Vermessungskunde* (Stuttgart, 1857); Helmert, *Theorien der Geodäsie* (Leipzig, 1880-84); United States Coast and Geodetic Survey annual publications; similar publications are issued by most European governments.

GEOFFREY (jəf'ri) **CRAY'ON, GENT.** See **CRAYON.**

GEOFFREY OF MONMOUTH, mōn'múth (c.1100-c.1154). A Welsh chronicler, born at Monmouth, Wales. He was consecrated Bishop of Saint Asaph in 1152, and died probably in 1154. He is the author of a famous book in Latin called *Historia Regum Britanniae* (History of the Kings of Britain), which was in circulation as early as 1139, and assumed its final shape probably a few years later. The book purports to be a translation from an ancient Kymric chronicle, which Walter, Archdeacon of Oxford, brought over from Brittany, and communicated to Geoffrey. As to how much truth there may be in the statement scholars do not agree. It has been shown that some parts are merely amplifications of the *Historia Britonum*, attributed, in its earliest form, to a certain Nennius (fl. 796). But for other parts no sources have been discovered. The book can hardly be regarded as a fabrication by Geoffrey, for it undoubtedly rests upon a mass of Kymric traditions which may have already assumed the form of a saga. Geoffrey gives the history of the kings of Britain from Brutus, the great-grandson of Æneas, down to Cadwallader, who at length, defeated by the Saxons, flees to Armorica, and then to Rome, where he dies. In the line of kings are Gorboduc, Cymbeline, and Lear. The story of the latter is related at large. Geoffrey's history is also one of the main sources (though not the only source) of the Arthur legend; and, as such, it is of the highest interest and value. Arthur indeed had been mentioned earlier; in Nennius he appears as a leader of the Britons (*dux bellorum*) in twelve great battles against the Saxons; and in William of Malmesbury's *Gesta Regum Anglorum* (1125) there are allusions to fables concerning Arthur. But in Geof-

frey first appears the Arthur legend somewhat as we now know it. Under the title of *Brut* (1155), Geoffrey's *History* was translated, with additions, into French verse by an Anglo-Norman poet named Wace. This version was rendered into English, with other additions, by Layamon in a poem also entitled *Brut* (about 1200). Geoffrey's book was first printed at Paris in 1508. The critical edition is by San Marta (Halle, 1854). For English translation, consult Thompson, *Geoffrey of Monmouth*, ed. by Giles (London, 1842). See **ARTHUR.**

GEOFFREY OF VILLEHARDOUIN, vā-lār'dwān' (c.1155-1213). A French chronicler of noble birth, born near Troyes. In 1199, while discharging the duties of Marshal at the Court of Thibaut of Champagne, he enlisted in the Fourth Crusade. He was sent as leader of an embassy to Dandolo, Doge of Venice, asking for transports for the Crusaders. Upon going to Constantinople, he was sent to Emperor Alexius to aid in settling difficulties which had arisen. He played a brilliant part in the conquest of Constantinople, and received from Baldwin I. (q.v.) lands in Macedonia and the title of Marshal of Rumania. After the defeat of Baldwin by the Bulgarians, he served Baldwin's brother Henry faithfully. He died in Thessaly. His history of the conquest of Constantinople is the earliest known historical work in the vernacular French. It is a brilliant but prejudiced account of the Fourth Crusade, in which Villehardouin seeks throughout to apologize for the misdeeds of the Christian leaders. This history was printed for the first time in 1573. The best modern edition is by De Wailly (Paris, 1872), which gives the original text of the thirteenth century, and a translation into modern French. For other editions of his writings and for secondary works, consult: Potthast, *Bibliotheca Historica Medii Ævi*, vol. ii. (Berlin, 1896); Masson, *Early Chroniclers of Europe: France* (London, n.d.).

GEOFFRIN, zhō'frān', MARIE THÉRÈSE (1699-1777). A wealthy patroness of letters, daughter of a valet-de-chambre, born in Paris. Her hospitality and liberality to men of letters earned her eulogies from D'Alembert, Thomas, and Morellet (*Eloges sur Mme. de Geoffrin*, Paris, 1812). To the *Encyclopédie* of D'Alembert and Diderot (q.v.) she contributed 100,000 francs. She died in Paris. Consult Ségur, *Le royaume de la rue Saint-Honoré, Mme. Geoffrin et sa cour* (Paris, 1897).

GEOFFROY, zhō'frwā', JEAN (1853-). A French painter, born at Marennes (Charente-Inférieure). He studied under Levasseur and Eugène Adan, and first exhibited in 1874. His paintings and illustrations chiefly depict childhood and poverty. His works in this class include "The Unfortunates," in the Luxembourg, and "The Prayer of the Humble," both sympathetically painted in a low key. He received a second-class medal in 1886.

GEOFFROY, JULIEN LOUIS (1743-1814). A French dramatic critic, born at Rennes. He studied to join the Order of the Jesuits, but upon its suppression became a teacher. He was the editor of several Royalist papers, such as the *Journal de Monsieur*, and *L'Ami du Roi*, and during the Revolution he was obliged to live in retirement. In 1806 he began his connection with the *Journal des Débats* as dramatic critic. He

was the vigorous opponent of eighteenth-century ideas, and its high priest, Voltaire, was his especial detestation; but, despite his narrowness and inordinate love of the classic, he had solid learning and a powerful pen. His daily criticisms have been collected under the title *Cours de littérature dramatique* (1819-20). He also wrote, among other volumes, *Discours sur la critique* (1779).

GEOFFROY DE VINSauf, de vān'sōf'. See VINSauf.

GEOFFROY SAINT-HILAIRE, sān'tē'la'r', ETIENNE (1772-1844). A French zoölogist, born at Etampes, France. He studied with Brissot, Haüy, and Daubenton. In 1793, when only twenty-one years old, he became professor of vertebrate zoölogy in the newly instituted Museum at Paris, and began to make the famous collection of animals in the Jardin des Plantes. In 1794 he invited Cuvier to Paris, and the two men became thenceforth associates in the field of natural history. In 1798 Geoffroy accompanied Bonaparte to Egypt, where he remained three years. In 1807 he became a member of the Académie des Sciences, and in 1809 professor of zoölogy in the Faculté des Sciences. Geoffroy Saint-Hilaire was by nature a philosopher, and by education an anatomist, and in his speculations held that a single plan of structure prevails throughout the animal kingdom. In this he was violently opposed by Cuvier, who was an empiricist and not a philosopher, and who maintained that four distinctively different types of structure were present. The two naturalists differed also in their conception of the mutability of species, Geoffroy arguing for it, and Cuvier against it. He raised teratology, or the study of monstrosities, to the rank of a science. Of his many works we may mention: *Philosophie anatomique* (1818-20); *Sur l'unité de composition organique* (1828); *Principe de philosophie zoölogique* (1830); *Etudes progressives d'un naturaliste* (1835); *Notions synthétiques, historiques et physiologiques de philosophie naturelle* (1838). For his views on species, and the relation he bore to Lamarck and the agitation leading toward the announcement of the hypothesis of evolution, consult: Packard, *Lamarck, His Life and Work* (New York, 1901); *Life of Geoffroy*, by his son (Paris, 1847).

GEOFFROY SAINT-HILAIRE, ISIDORE (1805-61). Son of Etienne. A French zoölogist. He was born in Paris, became assistant at the Museum of Natural History in 1824, and received a medical degree in 1829. He became professor of zoölogy in the Museum in 1841, and in the Faculté des Sciences in 1854, and in the same year he founded the Société d'Acclimatation. He wrote a life of his father, and also *Histoire générale et particulière des anomalies de l'organisation chez l'homme et les animaux* (1832-37) and *Histoire naturelle* (1854-62).

GEOG'NOSY (from Gk. γῆ, gē, earth + γνῶσις, gnōsis, knowledge). A study of the materials of which our planet consists. The term is not synonymous with geology, which concerns itself not only with the materials of the earth, but with theories as to their arrangement, succession, and development. As applied to rocks, the term geognosy is now superseded by petrography. See GEOLOGY.

GEOGRAPHICAL BOTANY. See DISTRIBUTION OF PLANTS.

GEOGRAPHICAL DISTRIBUTION OF ANIMALS. See DISTRIBUTION OF ANIMALS.

GEOGRAPHICAL NAMES, UNITED STATES BOARD ON. An organization for the purpose of introducing uniformity in the orthography and pronunciation of geographical names, instituted in 1890 by President Harrison, at the instance of a number of the Government departments, engaged in publishing maps, charts, and surveys. The arbitrary manner in which geographic names were spelled and pronounced prior to that time resulted in considerable confusion, particularly in the Post-Office Department, where names were often assigned to stations not at all in accord with common usage. The transliteration of Indian names and the Russian nomenclature in Alaska were also found to be misleading. To remedy these evils this board, at first a voluntary organization, was instituted with power to make final decision, binding upon all departments of the United States Government in cases where there existed a divergence in the spelling or pronunciation of geographic terms. The Board consists of twelve members, representing the Treasury, Navy, War, Interior, Agriculture, Post-Office departments, Smithsonian Institution, and the Government Printing Office. The Board aims, as a rule, to follow local usage, and to simplify names by dropping unnecessary letters, syllables, and the combination of compounds. In 1898 the Board was called to decide upon an extensive list of geographic names in the Philippines. The Board's reports have been published by direction of Congress.

GEOGRAPHICAL SOCIETY, AMERICAN. An association founded in New York City in 1852 to encourage geographical exploration and discovery. It seeks to diffuse geographical information, and for this purpose, coöperates with foreign consuls, missionaries, and nearly two hundred foreign scientific societies. It maintains a large library housed in a building valued at over \$300,000. There are 30,000 volumes, a large collection of charts, maps, atlases, all so indexed as to give specific information with the least possible amount of research. A journal called the *Bulletin*, giving the transactions of the society and much geographical information, is published five times a year. The society has given financial support to nearly all the Arctic explorations of the last half-century. Judge Charles P. Daly, president of the society for many years, left \$50,000 to it by bequest. In 1902 the society had 1300 members.

GEOGRAPHICAL SOCIETY, ROYAL. An association for the advancement and diffusion of geographical science, and for the encouragement of exploration, founded at London in 1830 and chartered in 1859. It had its inception with members of the Raleigh Dining Club, an organization of travelers, who desired to establish a society to aid scientific research in geography. It began its career under very favorable auspices, 460 fellows having enrolled the first year, among them the King, the Duke of Wellington, prominent army and navy officers, and leading scientists, whose number had increased by 1901 to over 4000. In 1832 it began to publish annually the results of investigations, together with its proceedings in the *Royal Geographical*

Journal; but the gradual increase in the contributions necessitated the reorganization of the publication, and accordingly in its place was substituted in 1880 a monthly magazine, entitled *The Proceedings of the Royal Geographical Society and Monthly Record*, which name was in 1893 changed to *The Geographical Journal*. In addition to the *Journal* the society also issues the *Year Book and Hints to Travelers*. It expends considerable sums every year for the encouragement of research and exploration. At the instance of the society Oxford appointed in 1888 a reader in geography, and in the same year Cambridge appointed a lecturer in geography, the society paying two-thirds of his salary. Since 1879 courses of instruction in the use of astronomical and surveying instruments have been offered under the auspices of the society to travelers, with the result that many of them have contributed to the library original charts and maps. The library of the society contains about 34,000 volumes, and a large collection of charts, maps, and globes.

GEOGRAPHICAL SOCIETY OF BALTIMORE. A society organized in 1902 for the purpose of promoting an interest in geographical science by public lectures and other meetings and by the encouragement of investigation. Daniel C. Gilman was elected first president of the society, which has nearly 1000 members on its rolls.

GEOGRAPHICAL SOCIETY OF PHILADELPHIA. The Geographical Society of Philadelphia had its inception in 1891. Two years later a charter was granted to the Geographical Club of Philadelphia, of which Angelo Heilprin was first president. In 1897 the society assumed its present title. It has contributed materially to the extension of geographical knowledge by supplying funds to exploring expeditions, by issuing a bulletin at intervals during the year, and through its library. The society confers annually a gold medal—known as the Elisha Kent Kane Medal—as a reward for eminent geographical work. It has been awarded in turn to Dr. A. Donaldson Smith and Commander R. E. Peary, U.S.N. The membership numbered 430 in 1902. In addition to its monthly stated meetings, the society has aimed to foster a local interest in geography by organizing courses of lectures of an educational character, and by offering prizes to public school scholars for essays on geographical subjects.

GEOGRAPHIC SOCIETY, NATIONAL. An organization with headquarters at Washington, in the District of Columbia, formed in 1888 to increase and diffuse geographic science. It offers annual courses of lectures in Washington upon popular geographical subjects, and publishes monthly the *National Geographic Magazine*. Its membership has increased rapidly and now numbers about 3000.

GEOGRAPHY (Lat. *geographia*, Gk. *γεωγραφία*, from *γεωγράφος*, *geographos*, geographer, from *γη*, earth + *γράφειν*, *graphein*, to write). Until recent years the science of this science, if it could be called science, has been confined, in the main, to a bald description of the earth, its phenomena, its countries, and its inhabitants. It has comprised little more than a collection of facts. In recent times, however, in common with

other branches of science, it has advanced greatly, especially in the study of the causes of phenomena. As its scope is now recognized, it may be defined as the science which concerns the earth's surface, including the areal distribution of all phenomena pertaining thereto, with the causes therefor. It may be divided into mathematical, physical, political, and economic geography.

Mathematical geography treats of the form, size, and movements of the earth, and herein is connected closely with astronomy; of parallels, meridians, latitudes, longitudes, projections, and methods of delineating the earth's surface, and hence includes geodesy, surveying, and cartography.

Physical geography treats of climate, including atmospheric pressure, temperature, and rainfall, which is the areal application of meteorology; of hydrography, including waves, tides, and currents of the sea, and the physics of the rivers and lakes of the earth; of physiography, or the study of the land forms of the earth, mountains, valleys, and plains, with their genesis, and here it touches closely upon the domain of geology; and of the distribution of life, vegetable and animal, as well as the distribution of minerals, thus applying the sciences of biology and mineralogy.

Political geography treats of man's institutions in their distribution over the earth, of countries, governments, cities, etc. It is closely related to the next and last group.

Economic geography treats of man's industries and products, of agriculture, mining, and fisheries, which yield raw materials, of manufactures, by which their forms are changed, and of trade and transportation or commerce, by which commodities are exchanged. The basis of much of this branch of geography is furnished by statistics. See GEOGRAPHY, ECONOMIC.

MATHEMATICAL GEOGRAPHY.

The form of the earth is spherical, with a slight flattening at the poles. Its equatorial diameter is 7926 and its polar diameter 7900 miles, the difference between them, 26 miles, measuring the eccentricity. This flattening of the earth at the poles is a necessary consequence of the earth's rotation about its axis. See EARTH.

The chief method employed in the determination of the size and form of the earth may be explained in general terms, without going into details. The latitudes and longitudes of two points, widely separated, are determined by astronomical means, and the direct distance between them is measured by geodetic methods. A comparison of the two methods gives the length of a degree or series of degrees of latitude and of longitude. Such arcs have been measured in various parts of the earth, from Northern Africa northward across Europe, in India, in the Andes of South America, across the United States from east to west, and southwest from New England to the Gulf coast.

Latitude is distance north or south of the equator expressed in terms of the angle subtended at the earth's centre. It is determined by measuring the angle of elevation of the sun or of any star whose position is known, when crossing the meridian of the place of observation; or most accurately, by measuring the difference between the zenith distances of two stars, whose position is known, such measurement being made by zenith

telescope. See LATITUDE AND LONGITUDE; DEGREE OF LATITUDE.

Longitude is distance east or west of a selected meridian, expressed in terms of the angle subtended at the earth's axis. The meridian of the observatory at Greenwich, England, has been almost universally adopted as the initial point for the statement of longitudes. Difference of longitude is difference of time. Since the earth revolves on its axis, i.e. turns 360° , once in 24 hours, an hour corresponds to 15° of longitude. Hence, in order to determine the difference of longitude between two places it is only necessary to determine and compare the local sidereal times of those two places. The determination of time is made by observing, with a transit instrument and chronometer, the passage of stars, whose position is known, across the meridian. The observed sidereal times of their passage, or transit, compared with their right ascensions, gives the error of the chronometer, and hence the true sidereal time. Local sidereal time of the two places is compared by the use of the telegraph. See LATITUDE AND LONGITUDE; DEGREE OF LONGITUDE.

Measurements of distance on the earth's surface are commonly made by triangulation. A base line, two to five miles long, is first measured directly, using steel wire, or tape, or bars. Angles are measured at each end of the base, between the other end and certain signals erected to the right and left, and from these signals the third angle of each triangle is measured. Then with the angles and one side known in each triangle the other sides may be computed, and these in turn become the bases for other triangles, as the work is extended. See ASTRONOMY; GEODESY.

The plane of the earth's orbit about the sun, known as the ecliptic, is inclined to the earth's equator at an angle of $23^\circ 28'$. Hence, in the course of the year the sun apparently moves north and south through an angle of $46^\circ 56'$, the equator being in the middle. The sun reaches its most northern position, which is known as the Tropic of Cancer, about June 21st, and its most southern point, the Tropic of Capricorn, about December 21st, passing the equator about March 21st and September 21st. This apparent movement of the sun causes the change of seasons.

There is an area about each of the poles of the earth where, in midwinter, the sun fails to rise above the horizon, even at midday, and where in midsummer it does not sink below the horizon, even at midnight. The circles bounding these areas are the polar circles, and the areas are the polar zones, distinguished as the Arctic and Antarctic. The areas lying between the polar circles and the tropics are the temperate zones, and that lying within the tropics the torrid zone.

Maps are representations, commonly upon flat surfaces, of all or parts of the earth's surface. The scale of a map is the relation which distances on the map bear to distances upon the area represented. They may be expressed in terms of miles or kilometers on the ground to an inch on the map, or by a fraction, as $\frac{1}{100,000}$ or 1:100,000 in which the numerator refers to the distance on the map, and the denominator to that on the ground, both being expressed in the same units, as feet, meters, or miles. A third method is by the 'bar scale,' in which actual measurements are drawn on the map, and marked with the distances which they represent in nature.

Maps may be classified in accordance with the kind of information which they present. Thus there are geological, climatic, and statistical maps. The maps considered here, however, are those only which represent the topographical features proper, the streams and other bodies of water, the relief of the country, its mountains, valleys, and plains, and the culture or the works of man, the cities, roads, railroads, boundaries, etc. Restricted to this definition, maps may be classified as: (1) Plans, which are upon large scales and represent limited areas, such as a city or township; (2) topographic maps, upon smaller scales, say from one to eight miles to an inch and covering much larger areas; and (3) geographic maps, upon smaller scales, and representing areas of States, countries, or continents. The distinction between them cannot be sharply drawn, although mainly one of scale, but it is a useful one. Another distinction may be made in maps, between the original maps, made directly from surveys, which are known as mother maps, and those derived or compiled from them.

The earth having a spherical surface and the map a plane surface, it is obvious that no map can be a strictly accurate reproduction, since there must always be error in the transfer. Various methods of projection, from the spherical to the plane surface, are in use, some applicable to one form of map, some to another. Among them are the following:

The orthographic, which is often used in the projection of a hemisphere, on a very small scale. Here the points on the hemisphere are supposed to be projected by means of parallel lines at right angles to the plane of projection, which is that of the great circle bounding the hemisphere. Here the eye is supposed to be at an infinite distance above the plane of projection.

In the stereographic projection the eye is supposed to be at the earth's surface opposite the area to be projected, the plane of projection being that of a great circle midway between them. The intersection of lines with this plane, drawn from the view-point to points to be reproduced, gives their positions. This also is used only for maps on small scales.

A third projection, also used only with small scales, is the globular projection. Here the view-point is placed on a perpendicular to the plane of projection, and at a distance outside the earth equal to the radius $\alpha 1/\sqrt{2}$, the plane of projection being similarly a great circle.

The projections in common use for geographic maps upon the larger scales and for topographic maps are the various forms of conical projections, and especially the polyconic, upon which the mother maps of nearly all nations are being made. The simple conical projection is made by assuming that the portion of the earth to be represented is wrapped in a cone, tangent to the earth at the mid-latitude of the area, its axis being the earth's axis, and its apex being on the prolonged axis. On this cone are projected by radial lines points on the sphere, and when the cone is unrolled they will appear on the flat surface. This projection is correct only on the middle parallel, and the distortion increases rapidly as the area increases. By combining many such cones, the distortion is greatly reduced, and the polyconic or many-cone projection is that in most general use for topographic maps.

A modification of the conical projection, known as the secant cone, is sometimes employed. Here the elements of the cone, instead of being tangent to the earth, cut it at two points, the cone being partly within and partly without the earth.

Mercator's projection, which is universally used in sailing charts, is supposed to be constructed on a cylinder, circumscribing the earth at the equator. Points on the earth are projected on the cylinder by radial lines from the earth's centre, and the cylinder then unrolled. Here the meridians are drawn as straight lines, parallel to one another, instead of converging as on the earth, and the spaces between the parallels are increased in the same proportion as are those between the meridians. Thus the scale of the chart increases from the equator toward the poles in the ratio of the tangent of the latitude. Because the meridians and parallels are represented as parallel straight lines, sailing courses are also represented by straight lines, a fact which renders the projection of special value to mariners.

The contents of topographic maps are commonly classed in three groups: Hydrography, including streams, lakes, and other water bodies; relief, the mountains, valleys, plains, etc.; and culture, or works of man, boundaries, cities, roads, railways, etc. The first of these groups is often represented in blue ink, the second in brown, and the last in black. These are the colors employed by the United States Geological Survey on its mother maps.

The relief has been represented on maps in various ways, but upon modern maps only two methods are employed, which may be characterized as the pictorial method and the contour method. In the first, a pictorial effect of hill shading is produced, either by the artistic use of crayon or water-color, or by drawing fine lines, parallel to the direction of slope of the ground, closest and heaviest where the slopes are steepest. When well done this hachure method produces fine pictorial effects, but it is expensive, and crayon is more commonly used at present.

The most modern method of representing relief and that which is growing into the widest use is the contour method. Here relief is shown by lines of equal altitude above the sea. These lines are drawn at right angles to the slope, and each line being everywhere at a certain height, the map shows the altitude of all parts of the region represented. Thus a contour map is a map of three dimensions, while other maps are of two dimensions only. Upon steep slopes the contours are, of course, near one another, and upon gentle slopes are far apart, and thus contours produce an effect like that of shading, but much inferior pictorially to that produced by hachures or crayon. See MAP.

PHYSICAL GEOGRAPHY.

The surface of the earth is divided between land and water in the proportions of 72 per cent. of water to 28 per cent. of land; or, in terms of area, the surface of the earth being about 197,000,000 square miles, 142,000,000 square miles are covered by water, and 55,000,000 square miles are land. Over all is spread the atmosphere, densest at the surface, and gradually becoming rarer above.

CLIMATOLOGY. This branch of physical geography is concerned with the general distribution of the phenomena of the atmosphere. The height

of the atmosphere is unknown, but from the rate at which its density diminishes with altitude above the earth's surface, it is clear that in a few miles it becomes extremely rare, so rare that its effects may be neglected. The pressure of the atmosphere at sea-level has an average value over the earth of 14 pounds per square inch, equivalent to about 30 inches of the mercurial column. In equatorial regions the pressure is slightly below and in temperate regions slightly above this average. See AIR; ATMOSPHERE; BAROMETER.

Heat is produced by the absorption of the sun's rays by the earth. The more nearly overhead the sun is, the more heat is received per unit of area, and the higher is the temperature, other things being equal. The degree of temperature at the earth's surface is, however, affected by other conditions, chief among which is the relative moisture of the air, since a moist air absorbs much of the heat before the rays reach the earth. Hence very high temperatures are not observed in moist equatorial regions, while in desert regions extraordinarily high temperatures have been observed. On the whole, however, the equatorial regions receive the greatest amount of heat, and the polar regions the least. Hence the air over the equator rises, being forced upward by the pressure of air on the north and south. This produces a flow of air toward the equator from both sides, a flow which would be directly south and north were it not for the rotation of the earth, which deflects the currents to the westward, and thus produces the well-known uniform trade winds. (See WIND.) The land absorbs heat rapidly, and is as rapidly cooled; the sea, on the contrary, absorbs heat slowly, and gives it out slowly. Moreover, by means of its waves, tides, and currents the waters of the sea circulate freely, and thus tend to establish a uniformity of temperature in its various parts. Hence it is that the sea is on an average throughout the year warmer in the north and south and cooler in the tropics than is the land in the same latitude. Moreover, the sea is cooler in summer and warmer in winter than is the land. The difference in the attitude of land and sea toward temperature produces monsoons and land and sea breezes. The latter are diurnal and strictly local. The land being heated during the day, the air over it rises, and thus induces an inward draught of air from the sea. At night, the air over the land being cooled, a reverse current is set up. The monsoon (q.v.) is a similar land and sea wind, but on a much greater scale, and is induced by differences of temperature between land and sea in summer and winter. There is a monsoon tendency on the margins of all continents, but in most cases it has little influence upon the more general movements of the atmosphere. The cooling of the land surface, and consequently of the surface atmosphere, after nightfall induces a local circulation of air in the interior of continents. This air, being cooled and consequently heavier, flows down slopes, and collects in the valleys. Hence in mountainous regions there is a wind at night down the canyons, and the air in the depressions is cooler than on the slopes above. Frosts occur in the valleys, while the slopes above may be exempt from them.

A fall of rain or snow requires the coexistence of two conditions, an atmosphere partly or wholly saturated with moisture, and the chilling of this atmosphere below the saturation point, which

may be brought about by forcing the air-currents up to an elevation, to a higher latitude, or by mixture with colder air. The trade winds of the Atlantic bring to the Amazon basin and the eastern slope of the Andes an atmosphere loaded with moisture, which, as the land is, during most of the year, cooler than the air, is deposited freely, giving this region a profuse rainfall, while the summit and western slope of the Andes within the tropics are mainly desert. The southwest monsoons of India and Southern China bring vast stores of moisture from the Indian Ocean, which are deposited freely upon the colder land. The west coast of the United States and Canada, under the influence of the prevailing westerlies from the Pacific, receives in winter, when the land is cold, a profuse rainfall, while in summer, when the land is warmer, these moist air-currents carry much of this moisture over into the Rocky Mountain region. Hence in Colorado, Arizona, and New Mexico the summer is the rainy season. The same westerly winds supply moisture from the Atlantic to Western Europe, and here, since there are no great mountain ranges to intercept it all at once, the rainfall is more generally distributed than in North America, being greatest on the coast, and diminishing gradually eastward, so that it is only in the far interior of Asia that desert conditions prevail. The southern part of South America lies within the region of the prevailing westerly winds, and here the western slopes of the Andes have an ample rainfall, while over the pampas of Argentina these winds, drained of most of their moisture in the passage over the Andes, blow as dry winds. See METEOROLOGY.

HYDROGRAPHY. The sea, including the Pacific, Atlantic, Indian, Arctic, and Antarctic oceans, with many great gulfs and bays, covers 72 per cent. of the earth's surface. Of these the Pacific is far the largest, comprising much more than half the water surface of the globe. The average depth of the sea is about two and a half miles, or 13,200 feet. The greatest depth yet measured in the Atlantic, at a point north of the West Indies, is 1660 fathoms. This depth is considerably exceeded in the Pacific, where, east of the Kermadec Islands, a sounding of 5147 fathoms, or 30,882 feet, has been obtained. See OCEAN; ATLANTIC OCEAN; etc.

The water of the ocean is strongly saline, being supplied constantly by streams whose waters contain saline material in solution in greater or less amount. Even if the amount be trifling, since there is no outlet save evaporation, its degree of salinity is merely a question of time. The salinity of certain land-locked seas, situated in hot regions, such as the Red Sea and the Mediterranean, is greater than that of the open ocean, owing to excessive evaporation from their surfaces.

The temperature of the surface water ranges from the freezing-point in Arctic regions to 90° in land-locked seas, in the tropics, such as the Red and Caribbean seas. The annual range of temperature at the surface is small, except in localities where currents change their positions with the seasons. At moderate depths there is no change of temperature throughout the year, and at great depths the temperature in all parts of the sea is very nearly the same, being but little above the freezing-point.

The surface waters of the sea are disturbed by waves and tides, and moved about by currents and drifts. Waves are set in motion by the wind, but have little movement of translation, consisting mainly of vertical oscillations. They are rarely one-fourth of a mile in length from crest to crest, and fifty feet in height. The tides (q.v.) are oscillations in the sea surface, occurring twice a day, one of them following the passage of the moon across the meridian, the other nearly twelve hours later. They are slight in the open sea, being not more than two or three feet, but upon the seacoast they are commonly much higher, and at the heads of funnel-shaped bays are, in many cases, very high. The tides are due to the difference in the force of attraction, mainly of the moon, upon the surface of the earth and its centre, owing to their difference in distance from it. Drifts are surface water transported by the wind. The movement is commonly very slow, and changes in direction with the wind. When driven by constant winds, such drifts do, in some cases, develop into currents. (See OCEAN CURRENTS.) The great ocean currents, such as the equatorial currents, the Gulf Stream (q.v.), and the Japan current, thus originate. The constant trade winds, blowing from the northeast and the southeast diagonally toward the equator, induce great drifts in these directions. These, meeting near the equator, flow westward across the oceans. See HYDROGRAPHY.

PHYSIOGRAPHY. The study of the land forms of the earth, with their present distribution and their mode of origin, is a comparatively new branch of science.

The volume of the land above sea-level is much less proportionally than the volume of the sea; the average level of the solid crust of the earth is estimated at 7500 feet below sea-level. The average altitude of the land lying above sea-level is estimated at 2250 feet, the extreme height being Mount Everest, in the Himalayas, 29,000 feet. See CONTINENT; AMERICA; EUROPE; etc.

The forms of relief of the earth, as they exist to-day, are the resultant of two opposing operations, upbuilding and leveling. Chief among the former are earth movements, whose visible results are folds and faults, uplifted ridges and blocks of land. Rivers, glaciers, and winds also act as constructive agents, in depositing sand, gravel, and other detritus. Strains in the earth's crust, produced perhaps by shrinking of the interior on cooling, result in folds and breaks in the crusts. These may be of small extent, producing mountain ridges, or they may involve large parts of the earth, resulting in raising continents above the sea. They may be low and flat, or they may be high and sharp, even to so great an extent that the sides of the fold pass beyond the vertical. (See FAULT; ANTICLINE; SYNCLINE.) Lava flows out from vents, and spreads over great areas, or it may be forced in between beds of stratified rock, or, in a plastic state, be forced up through such beds.

No sooner has a region been uplifted than the agencies of erosion, always at work, attack it with renewed activity. Water percolates into the seams and crevices of the rocks, and freezing, splits them into fragments by its expansion. Water, often with acids in solution, dissolves the soluble portions of the rocks, and thus disintegrates them. Flowing water, glacial ice, and the

wind wear the rock away. The rock waste thus produced is transported, always downward, by the winds, streams, glaciers, and its own weight, most of it having the sea bottom as its ultimate destination. On the way, however, some of it is deposited, as in dunes, moraines, and deltas, and thus the agencies of destruction are also constructive agents. Thus there is a constant movement downward, from the land to the sea. Unless this is offset by elevation movements in the crust of the land, it results eventually in the reduction of the land to a low plain. Furthermore, if the limits of sea and land remain constant, there is a vast accumulation of sediment on the sea bottom, and a corresponding thinning of the solid crust over the land. See **PHYSIOGRAPHY; GEOLOGY.**

THE DISTRIBUTION OF LIFE. The distribution of plants and animals is determined by a number of factors, which are more or less interdependent. The chief of these are the physical characteristics, the climate, topography, etc., of the region, with which should be coupled the characteristics of plant and animal life. Closely related to these are the changes in climate, topography, etc., and the adaptability of various species. Other factors are the means of dispersal of forms of life, and the results of the competitive struggle for existence among them. Under the last should be included the results of man's interference with the adjustment of life conditions which prevailed upon his advent.

The play of the above agencies has resulted in a somewhat complex distribution, some of whose features are not yet easy to explain. In some cases widely separated regions have fauna and flora remarkably similar, like the British Isles and those of Northern Japan. The physical conditions are quite similar, but the areas are separated by almost the semi-circumference of the globe. On the other hand, adjacent regions, with similar physical conditions, often differ widely in fauna and flora, as in the case of Australia and New Zealand. Regions with very different fauna and flora are, in some cases, connected by transition zones, through which the change is made gradually, while in other cases the change is a sudden and violent one. Certain well-marked types occur in scattered localities, in various parts of the earth, without apparent connection one with another.

Although much study has been devoted to the subject, no satisfactory classification of the earth's surface with respect to its life has yet been evolved.

In polar regions, such as the northern parts of North America, Europe, and Asia, the soil is permanently frozen below, thawing only at the surface in summer, thus forming the well-known tundra, whose chief vegetation is reindeer-moss, among which bloom in summer many bright-colored flowers. This tundra passes in less cold regions into moors and heaths.

Desert regions are characterized by a scanty growth of yucca, and many species of thorny shrubs; where desert conditions are less intense, various species of *Artemisia* abound. The great plains of North America, the pampas of Argentina, and the Siberian steppes, which may be characterized as sub-humid regions, are clothed with grasses, and these pass, by insensible degrees, through prairie regions, of mingled grasses and woods, to forested regions. These differ

widely in character in different parts of the earth. In the colder regions coniferous forests prevail; in the more temperate regions conifers and broad-leaved trees are mingled, while the forests of tropical regions are commonly of the latter class, with dense undergrowth. The greatest and densest forests are, as a rule, found in regions of heaviest rainfall. Thus the broader distinctions in the character of the vegetation are in great part controlled by temperature and rainfall. See **DISTRIBUTION OF PLANTS.**

The faunas of the earth are less dependent upon climate than the floras, since animals can migrate somewhat freely, and have, in greater or less degree, the ability to protect themselves from its adverse elements. Still, each climatic zone has a fauna of its own, differing markedly from neighboring ones; the polar from the temperate, and the temperate from the tropic zone. The musk-ox, polar bear, and Arctic foxes, blue and white, are confined to regions of ice and snow. In temperate regions their nearest relatives are the bison, the black and grizzly bears, and the red fox, who range with the wapiti, antelope, and many species of deer. The tropic fauna is probably less closely related to that of temperate regions. It is characterized by large mammals, the elephant, rhinoceros, hippopotamus, camel, lion, tiger, leopard, many species of marsupials (in Australia), monkeys, etc. The fauna of the desert differs widely from that of well-watered regions in amount, variety, and species, which is due, in great part, of course, to the difference in plant food-supply. In the same latitudes and similar climates there are both close agreements and wide differences. Thus the faunas of Europe and North America do not differ materially, but between Australia, Africa, and South America there are wide, even radical differences. Australia, with its marsupial fauna, resembles no other region on earth, and at few points are there resemblances between Africa and South America. The great carnivora of the former continent have few representatives in South America. See **DISTRIBUTION OF ANIMALS.**

Of all forms of life, man is the most cosmopolitan. He is found from the frozen regions to the equator. His ability to protect himself from hostile climatic conditions enables him to survive even under those most adverse, but certain conditions seem to be the most favorable to his development. Arctic conditions, where besides a hostile climate the economic conditions are severe, are not conducive to his development. On the other hand, the languid climate of the tropics, with the ease of living, seems equally unfitted for the development of civilization. It is in temperate climates, which stimulate exertion, and where effort meets with adequate reward, that man has reached the highest level.

The races of mankind are commonly classified according to color and other characteristics as fair-complexioned or Caucasian, yellow or Asiatic, brown or East Indian, red or American Indian, and black or negro. The Caucasians (including all the Indo-European peoples, the Semites and the Hamites, the last-named being dark-skinned) inhabit Europe, a large part of Asia (mainly in the south and southwest), Northern Africa, North America, South America (in parts of which they are outnumbered by the red race), and Australia, and are scattered, in

greater or less numbers, over other parts of the earth. The yellow race comprises the Chinese, Japanese, Koreans, Tibetans, and various peoples of Central and Southeastern Asia. The brown peoples are those of the Malay Peninsula, the East India Islands, and Polynesia. The American Indians inhabited the entire continent from Bering Strait to Cape Horn, but in Central and South America they have become much mixed in blood with their Spanish conquerors. The black race, whose home is Africa, have been subjected to forced migrations, under slavery, and many millions of them are now found in the United States, the West India Islands, and Brazil. See MAN, SCIENCE OF.

POLITICAL GEOGRAPHY.

The migrations of man over the earth's surface, his present location, and the stage of civilization which he has reached, are, in the last analysis, the results of geographical environment, whatever the immediate cause may be. Great Britain has become, because of her insular position, and her limited farming area, a great commercial nation. New England, by reason of the destructive competition of Western farms, has changed her industries from agriculture to manufactures. Thus the climate, soil, and surface determine in great measure the products and leading industries of a region, subject, of course, to the degree of civilization of the inhabitants.

The leading industries of mankind—pastoral pursuits, mining, fishing, agriculture, manufactures, and commerce—require different forms of distribution of the inhabitants. Pastoral pursuits imply a very sparse population scantily distributed, since cattle and sheep require large areas for their sustenance. In agriculture, a much smaller area to a family suffices, implying a much denser population, while manufacturing and commerce require that people be closely grouped in towns and cities. Hence in the history of the settlement of a region, we may often trace a direct connection between the principal vocations of the people and the average density of population. In early stages of settlement, when the people are few in number and widely separated, pastoral pursuits are the principal ones. As population increases, the herders are crowded out by the farmers, and still later cities spring up and grow, and manufactures and commerce become the dominant industries.

Cities have been located from a great variety of considerations. Anciently a common cause of their location was protection from enemies, and hence they were placed in easily defensible positions. As wars have become less frequent, and as private property has become more exempt from danger, they have been placed in industrially strategical positions, commercial cities on harbors, manufacturing cities at sites of water-power, etc. Often, however, through changes in industrial methods, such locations cease to be advantageous, yet, through sheer inertia, the cities remain and grow.

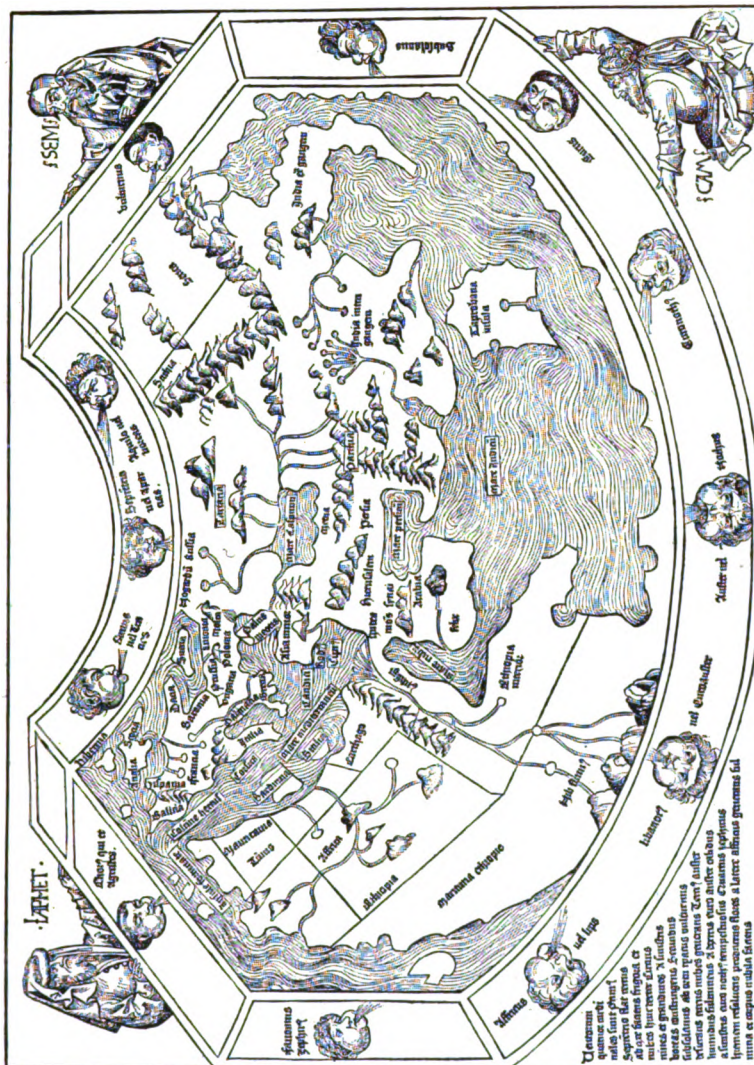
The form of land-holdings is significant of the degree of civilization, and often, on the other hand, may hasten or retard its progress. Among savage and barbarous peoples, and even those possessing some degree of civilization, such as the Russian peasantry, land is held in common by communities. Among most highly civilized peoples individual ownership is well-nigh uni-

versal, and such a form of ownership undoubtedly conduces to a high development of the race, as it carries with it a sense of proprietorship and responsibility.

The people of the earth are organized into communities, various in form, size, and character, for governmental purposes. Savages are grouped in clans and tribes, civilized man into empires, kingdoms, and republics. With primitive man the functions of government are few, and are mainly confined to war, offensive and defensive, and the organization is feeble and often short-lived. With advance in civilization comes an increase in the strength of the government, and an extension of its functions. From being only an offensive and defensive league, the government of a civilized nation defends the rights of its citizens against one another, protects them in person and property, in many cases educates them, and maintains public utilities, such as surveys, means of communication, water-supply, lighting, etc. Indeed, there is a perceptible tendency to go much further in the direction of socialism, so as to endanger the self-dependence of the individual, as is shown in recent developments in Germany and the experiments in New Zealand.

The form of government, whether known as empire, monarchy, kingdom, or republic, differs widely in the degree of power centralized in the hands of the chief executive and that retained by the representatives of the people. As a rule, the more highly civilized the people, the greater the share which they have in the government, and the lower the degree of civilization, the more absolute is the sovereign. The names by which governments are known are in many cases not descriptive. Most of the countries of Western Europe which possess a high degree of civilization are of the type which may be called constitutional monarchies. The executive power is in the hands of hereditary monarchs, and ministers of their choosing, while the laws are made by legislative bodies elected, in the main at least, by the people. Thus are governed the United Kingdom, Germany, the Netherlands, Belgium, Italy, Greece, Spain, Portugal, Austria-Hungary, Norway and Sweden, Denmark, Rumania, Servia, and Bulgaria. France and Switzerland, as well as the United States, are republics, in which the executive head of the Government and the legislative bodies are elected by the people. The other independent governments of America are nominally republics. Japan has recently been transformed into a constitutional monarchy. Russia, Turkey, Morocco, Persia, and Korea are absolute monarchies, in which the people have little or no voice. In the Chinese Empire the central authority is limited by the great measure of independence enjoyed by the individual provinces.

The relations of colonies to the mother country are various in form. Certain colonies of the United Kingdom—Canada, Australia, New Zealand, Cape Colony, and Natal—are practically independent in local matters, the mother country being represented only by a Governor-General, who is nominally the administrative head, as the representative of the Crown. In India, the entire government is carried on by Englishmen, except in the native States, where British influence is exerted by a resident. Other colonies



Rubus dicitur a rota et est quibet figura spectata et rotunda. Et
videtur mihi obitus beati rotas: et ad oibz terris et obstituta
est. Et dicitur ad bin viros, filii hominibus alia, filii dei affini
et filii lapidei europaei, filii hominum, affinitas et obitus vultus et
obitus partium non equit. Tria alia a meritis et consuetudine vici ad septem
truncos puenit: Europa vero a septemtrione vici ad occidentem ptingit.
Et ad affinitas ad occidentem et meridiem se erigitur. De qua quoad alia

conmet vnam partem nostræ barbaribus. i. medietatem: alie vna pars. i. affrica: i. europæ aliam medietatem
inter gentes. Inter hæc autem partes ab occidente magis progreduntur. calig. interficit: quæpote: si
vna pars gentis occidit: et occidentem orbem nudare in viam erit in alia vna affrica: i. europæ. Ecce autem
hæc sunt gentes quæ in vna parte orbis habitant. Inter quos sunt qui possident sua aliam. Barbari europæi: ibi affri
ci possident: et vici quoque. i. super libyæ paratello. pauno. i. inter vici et nollemus. i. inter
vici et palinæ.

of the United Kingdom are governed by the home country, as are most of the colonies of France and the Netherlands.

Boundaries between nations and States differ widely in character. Some follow defined parallels, or meridians, others the mid-channel or bank of a stream, others the summit of a mountain range, while many follow a series of arbitrary lines, and are, it may be, the result of many adjustments. The boundaries of the older countries of Europe are in most cases of this last class. In any case, if the boundary has been surveyed and marked, the marks become the boundary whether they conform to the treaty or law or not.

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HISTORY OF GEOGRAPHY.

The history of geography falls naturally into two divisions, the first of which records the development of ideas regarding the shape and size of the earth, while the second deals with the gradual increase of definite information about the actual facts of land and water distribution. The conception of the earth as a flat surface, probably encircled by water, is common to all primitive peoples. This idea, which is still held by many savage tribes, was gradually discarded as the mathematical sciences and philosophical speculation in general developed, and the Greeks finally succeeded in proving that the world is a globe. Aristotle is ordinarily credited with this discovery, though the Pythagoreans taught the doctrine of the rotundity of the earth long before his time. Aristotle estimated the circumference of the globe at about 40,000 miles.

The earliest map representing the known portion of the earth is that of the Greek Anaximander, who lived B.C. 610 to 546. Hecataeus, also a Greek, who lived between B.C. 550 and 475, and who had traveled extensively in Egypt, Persia, Libya, Spain, and Italy, wrote a book describing these countries, and made a map improving and extending that of Anaximander. Thales, a Greek of Miletus, who flourished about B.C. 600, divided the earth into five climatic zones, much as they are recognized to-day, and introduced the

equator and meridians. He discovered that the plane of the ecliptic is inclined to that of the equator, and made a rough measurement of the inclination.

The real founder of scientific geography was Eratosthenes, librarian of Alexandria (c.276-195 B.C.). He made accurate measurements of the length of the sun's shadow at Alexandria, and at the first cataract of the Nile, assuming that they were on the same meridian, and thus calculated the earth's circumference as about 25,000 miles, which is surprisingly near the actual figure.

Strabo, who was born about B.C. 60, was the first to attempt a work on general geography. His treatise consists of seventeen volumes, two of which are devoted to the world at large as an introduction, ten volumes to Europe, four to Asia, and the remaining one to Africa.

The great work of Ptolemy, the Alexandrian, who lived in the second century of our era, marked an epoch in early geographical science, and was for many centuries the paramount authority on the subject of the earth, and his map was that universally used. Still, the map contained several serious errors, which had far-reaching results. He fell into the error of adopting the result given by Posidonius for the earth's circumference, and this, together with an error in the longitude of the Canaries, which marked his initial meridian, resulted in bringing the west coast of Europe and Africa within 9000 miles of the east coast of Asia. It was this which induced Columbus, thirteen and a half centuries later, to voyage westward to reach the Indies. The map is constructed on a reticule of parallels and meridians, and though its errors of position and form in detail are many, it shows in comparison with earlier maps, especially that of Hecataeus, a vast extension of the known world. The advances in knowledge thus made were largely lost during the Middle Ages, when the scholastics developed the older plane-surface theory of a world, with Jerusalem as the centre of the universe. The most elaborate treatise embodying these ideas is that of Cosmas Indicopleustes, who lived in the sixth century (a translation has been published by the Hakluyt Society, London, 1899). Many specimens of mediæval cartographs, embodying these ideas, have survived, the most important of which have been reproduced by Prof. Konrad Miller of Stuttgart. Bunbury, *History of Ancient Geography* (London, 1879); Tozer, *Ancient Geography* (London, 1897); and Beazley, *Dawn of Modern Geography* (London, 1897), are important works upon this phase of the subject. The modern development of ideas concerning the form and magnitude of the earth is treated in the articles on **ASTRONOMY** and **NAVIGATION**.

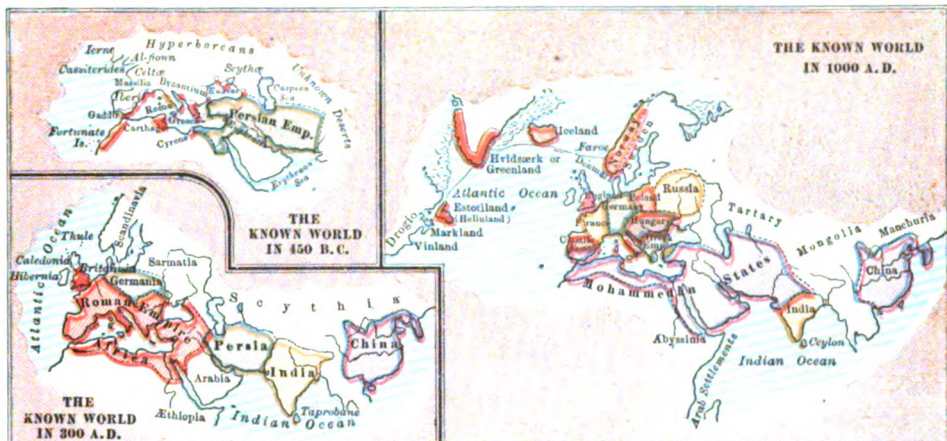
EXPLORATION, ANCIENT. The legend of the Argonauts undoubtedly grew up around the story of actual voyages made by the early Greeks to the Far East. The Phœnicians were the first nation of discoverers, and, like most of their successors, they were animated by the desire of gain. Tyre and Sidon became great commercial centres, from which ships sailed to all the Mediterranean waters, and to which traders came from India and from the lands beyond the Red Sea a thousand years before the Christian Era. By the time of Herodotus (c.484-424 B.C.) Phœnician voyagers

had passed through the Straits of Gibraltar, the ancient Pillars of Hercules, establishing settlements along the northwestern African coast, or coasting across the Bay of Biscay to the tin-mines of Cornwall. The Phœnicians made valuable contributions to the exact knowledge of geography in their *peripli* or itineraries. The names of two famous sea captains are associated with the furthestmost extension of Phœnician exploration: that of Hanno (about B.C. 450), who led a party of several thousand colonists down the African coast to the neighborhood of Sierra Leone, and that of Himilco (about B.C. 500), who sailed beyond Cornwall to Ierne or Ireland. Another famous voyage was made somewhat previous to this time by an Egyptian fleet dispatched by the Pharaoh Necho, which started from the Red Sea and, as it is reported, returned through the Straits of Gibraltar after a voyage around Africa lasting several years. About B.C. 320 Pytheas, a Carthaginian navigator, set out from Marseilles, and sailed past the coast of Spain and Gaul as far as 'Ultima Thule,' probably the Shetland Islands. The conquests of Alexander the Great added little to the limits of exploration, but proved of inestimable service in bringing Europe and Asia together, and giving the West some knowledge of the countries and characteristics of the East. Rome continued the work of increasing and unifying the geographical knowledge of the world, and brought Britain, Germany, and many other border regions within the circle of civilized nations. Much of this knowledge was wiped out in Europe by the irruptions of the Germanic and Tatar tribes, but much, too, was fortunately saved by the Arabians, who rose to power after 630. Science and learning, driven out of Europe, flourished at Bagdad, Damascus, and Cordova, and other capitals of Islam. After 800 the study of the Ptolemaic cosmography was assiduously carried on, and important geographical treatises were composed by Abu Jaafra Mohammed, who wrote between 813 and 833; Al Masudi, who, between 943 and 947, traveled extensively in Southern Europe and Asia, going as far as China; and Idrisi, whose comprehensive *Geographer's Garden of Delight* appeared in 1154. The greatest of the Mohammedan travelers was Ibn Batuta (c.1304-78), a Moor of Tangiers in Morocco, who traversed Northern Africa, Asia Minor, India, China, and the steppes of Southern Russia and Central Asia, covering nearly 75,000 miles. When the Renaissance came in Europe much of the older geographical learning was recovered from Arabic books and scholars. During the mediæval period the journeys of Benjamin of Tudela (1160-1173), Friar John of Piano Carpini in 1245, William of Ruysbroeck in 1255, and the Franciscan Friar Odoric (1316-1330), served to keep Europe in touch with what was happening in Asia. Much more important were the travels of Marco Polo of Venice, because the spirited account of his adventures and observations, written after his return in 1295, acted greatly toward the revival of active exploration.

EXPLORATION, MODERN. This revival is associated with the name of Prince Henry of Portugal, known as 'the Navigator.' Prince Henry devoted all his time and resources, from 1418 until his death in 1460, to fostering maritime exploration, with the results detailed in the article on **AFRICA**, under **History**. Of the Mediterranean nations, Italy especially furnished a remarkable succes-

sion of navigators, who, sailing under other flags, doubled the extent of the known world during the century following the death of Prince Henry. Columbus in 1492 proved the possibility of crossing the Atlantic, and discovered the New World, which he took to be the Indies; John Cabot in 1497 landed on the coast of North America; Vespucci between 1497 and 1501 established the continental character of the southwestern Atlantic shores; and Verrazano gave France her claim to the northern continent in 1524. Before the advent of these Italians Bartholomeu Dias in 1488 rounded the southern point of Africa. In 1497-98 Vasco da Gama made the sea voyage to the real Indies by way of the Cape of Good Hope. For the next hundred years discoveries followed close upon each other, until all the main features of sea and land upon the globe had been determined. Serrão reached the Moluccas or Spice Islands by way of India in 1512, and in 1520-21 Magellan found the way to them across the Pacific. Magellan perished in the Philippines; but his ship, the *Victoria*, kept on her voyage westward to Spain, completing the first circumnavigation of the globe. Cartier in 1534 entered the Saint Lawrence, and with the exploration of that river basin began the work which was continued by Champlain, Joliet, and the Jesuit fathers in the seventeenth century, and completed by La Salle, who reached the mouth of the Mississippi in 1682, thus establishing the general character of the interior of North America. In 1542 Antonio de Mota reached Japan, and in the same year Gaetano discovered the Sandwich or Hawaiian Islands. In 1553 and 1556 Sir Hugh Willoughby, Richard Chancellor, and Stephen Burrough sailed around Northern Scandinavia to Archangel, sighting Nova Zembla. Chancellor and Jenkinson proceeded to Moscow, and thence the latter went on to Bokhara, bringing back to Europe much information about the interior of Russia. Frobisher began the long record of English explorations in the Northwest in 1576, and the next year Drake started on the second circumnavigation of the globe. Australia was discovered by Torres and the Dutch sailors of the *Duyfken* in 1606, although it is possible that it had been seen a few years before by the Portuguese. In 1642 Tasman completed the delineation of the main outlines of this continent, and established the character of the lands beyond it to the south and east. For a century and a half the tide of discovery slackened while the nations of Europe were busy with the task of occupying and exploiting the vast areas newly brought to their knowledge. Then came the work of Bering, who in 1728 established the boundary between Asia and America at the strait which had been reached in 1648 by Deshnev (and which received the name of Bering Strait), and that of Captain Cook, who between 1768 and 1779 completed the survey of the water world, proving that there was no large habitable land mass undiscovered in the Southern Hemisphere. The work of Cook was perfected by La Pérouse, who finished the delimitation of the oceans in 1788.

Meanwhile the scientific exploration of the interior of the continents had begun. In 1740 Varenne de la Véranderye reached the Rocky Mountains of North America, and in 1771 Hearne penetrated to the Arctic shores of the same continent by way of the Coppermine River. In 1768-72 Bruce began the century-long task of opening



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up the interior of Africa by his journey to the headwaters of the Blue Nile. In 1789 Mackenzie discovered the great river to which his name is given. Lewis and Clark (1803-06) and Pike (1805-07) filled in many of the important features of the Western United States. From 1799 to 1804 Humboldt traveled in the West Indies, Mexico, and South America, and by the accurate and comprehensive reports of his observations set a new standard which has increased immensely the value and trustworthiness of most of the geographical work done since his time. Mungo Park had reached the Niger in 1796. Through his explorations and those of Clapperton, Denham, and Lander, the problem of the source of the Niger was solved by 1830. In the course of their journeys, Clapperton and Denham reached Lake Chad in 1823. In 1828 René Caillié visited Timbuktu, where Laing had been killed in 1826. Livingstone crossed South Africa, tracing the course of the Zambezi, between 1849 and 1856, and in 1859 he discovered Lake Nyassa. While Livingstone was traveling in the region of the Zambezi, the German traveler Barth was engaged in a remarkable series of explorations in Western Sudan. Burton and Speke found the way to Tanganyika and Victoria Nyanza in 1858, and within the next six years Grant, Speke, and Baker approximately solved the problem of the real sources of the Nile. Lake Albert Nyanza was reached by Baker in 1864. Stanley in 1876-77 traced the course of the Congo, the principal affluents of which were observed by Wissmann during his two journeys across Africa between 1881 and 1887. In 1887 Stanley set out on the Emin Pasha relief expedition, in the course of which he discovered the Mountains of the Moon of Ptolemy. Asia, largely because it has been in parts longest known, remained for a time least known to Europeans. Between 1785 and 1794 Billings surveyed Eastern Siberia. Somewhat earlier, in 1761-67, Niebuhr had explored parts of Arabia, a work which was supplemented by Palgrave in 1862-63. In 1856-57 the brothers Schlagintweit crossed the Himalayas and Tibet. In 1868 Richthofen entered upon his career as a Chinese explorer, and about the same time Ney Elias traversed Central China. The arid wastes of Central Asia included within the Chinese Empire were visited four times between 1871 and 1888 by Priezevalsky. Valikhanoff reached Yarkand in 1859, and in 1870 Fedtchenko penetrated into the country north of Pamir. The course of the Yang-tse, Pekong, and Brahmaputra rivers was traced by the Pundit Krishna between 1878 and 1882. Younghusband traveled from Peking to Kashmir in 1887. Among other recent explorers of Central Asia have been Sosnovski, Potanin, Pyetsov, and other distinguished Russian travelers, Bell, Carey, Rockhill, Bonvalot, Henry of Orleans, Littledale, and Sven Hedin, who spent the years from 1893 to 1900 in exploring Chinese Turkestan, Tibet, and Mongolia.

Among the great Arctic explorers of the first half of the nineteenth century were Parry, the two Rosses, and Sir John Franklin. See **POLAR RESEARCH**.

Final proof of the fact that the oceans encircle the continents was supplied by McClure's achievement of the northwest passage (1850-54), and by Nordenskjöld's voyage from Norway along the Siberian coast and out through Bering Strait in 1878-79. In 1892 Peary established the insular

character of Greenland. Nansen's voyage in the *Fram* (1893-96) determined the problem of the Arctic ice motion, and proved that there can be no large land division at the North Pole. Borchgrevink visited the Antarctic regions in 1894-95, and again in 1898-1900, and his observations are now being extended by the cooperating expeditions from England, Germany, and Norway.

The first geographical atlas was prepared by Claudius Ptolemy at Alexandria about A.D. 150. This gave the location of places on the earth's surface, and continued to be the best compendium for fourteen hundred years. It was printed many times during the fifteenth and sixteenth centuries, usually with the addition of maps embodying the results of contemporary travel and observation. It was finally superseded by the *Atlas of Ortelius*, published in 1570, and this in turn gave place in 1595 to that of Mercator, who had devised, about 1539, the principle of the projection known by his name, a scheme for representing a spherical surface on a plane, which is still most commonly used for practical working charts and maps. Ramusio and Hakluyt, contemporaries of Mercator, published the first two great collections of travels in the less-known parts of the world, thereby providing the data for succeeding efforts to enlarge geographical knowledge. Atlases making notable contributions to general knowledge were published by Blaeu in 1638, Sanson in 1645, Delisle in 1700, D'Anville, 1745-71, and Stieler in 1817. Malte-Brun began the publication of his great *Géographie universelle* at Paris in 1810. One of the most distinguished names in the history of geographical literature is that of Karl Ritter, who died in the same year with Alexander Humboldt (1859). The publications of the Royal Geographical Society, founded in 1830, and *Petermann's Mittheilungen*, begun in 1845, are the most important sources of information on all matters of geographical interest. Jomard, *Monuments de la Géographie* (Paris, 1842-62), and Nordenskjöld, *Facsimile Atlas* (Stockholm, 1889), and *Periplus* (Stockholm, 1897), are the principal sources of the study of early cartography. A monumental work on general geography is Reclus, *Nouvelle géographie universelle* (19 vols., Paris, 1875-94). The most valuable and comprehensive encyclopædia of geography is the *Dictionnaire de géographie universelle* of Vivien de Saint-Martin (Paris, 1877-90; supplement, 1895-1900). Consult: Cooley, *History of Maritime and Inland Discoveries* (London, 1831); Vivien de Saint-Martin, *Histoire de la géographie* (Paris, 1873); Lelewel, *Géographie du moyen âge* (Brussels, 1852). German treatises on the age of discovery, "Das Zeitalter der Entdeckungen," are those of Peschel (Munich, 1858 and 1865), Ruge (Berlin, 1881 and 1892), Kretschmer (Berlin, 1892), and Günther (Berlin, 1892). Of special works the most important are those of Harris and Winsor on America; Grimm and Calvert on Australia; and Kiepert, Brown, and Scott-Keltie on Africa.

GEOGRAPHY, ECONOMIC. A new phrase, peculiar to the United States, although a result of the development of geography as a science in Germany. As yet it is loosely used, and indicates an appreciation on the part of American geographers of the work done in the Old World to connect economic facts with geographical conditions. It is apt to take the form of a mere

compilation of facts, especially concerning commercial products. An American geographer, Professor Keasbey (q.v.), in sympathy with European studies, has recently presented a logical classification of the principles and subject matter of geography. He defines economic geography as "a descriptive study of the natural resources of the earth and their application through processes of production, distribution, and exchange to the satisfaction of human wants."

To appreciate Dr. Keasbey's classification it is necessary to indicate briefly the development of departments in geographical study. While Humboldt first recognized geography as a science, it was due to Ritter that geography took a definite place in the curriculums of German universities. Berghaus, Peschel, and Richthofen laid greater emphasis upon physical geography, but Richthofen distinguished three departments: (1) Physical geography; (2) zoögeography and phytogeography; (3) anthropogeography. With Ratzel and his contemporaries interest has returned to the human influence—the connection between politics and geography. The present classification includes: (1) Mathematical geography, which is dependent upon astronomy, dealing with the earth as a whole and its place in the solar system; (2) physical geography, which draws its conclusions from geology, physics, oceanography, and meteorology, and describes "the superficial properties of the globe, the rigid lithosphere, the mobile hydrosphere, and the circumambient atmosphere;" (3) biogeography, dependent on biology, dealing with the distribution of species, and recognizing the world as adapted to the support of life; its divisions are: (a) botanical geography or phytogeography; (b) zoögeography; and (c) anthropogeography. At this point a co-ordinating principle for the classification of the facts which show the effect of geographical conditions upon civilization has not been definitely accepted. Some geographers extend the meaning of anthropogeography and include all human activities under it. Political and commercial geography are the usual European classifications. In their treatment they ordinarily recognize an economic basis for the facts.

Dr. Keasbey's classification follows out the previous principle of relating each department of geography to some science. Following biogeography should come economic geography, dependent upon the science of economics. Later may be developed commercial geography, dependent upon commerce, and political geography, dependent upon politics. The whole classification he further coördinates by showing that mathematical geography, dealing with universal phenomena, and physical geography, dealing with organic phenomena, are cosmic in their purpose; that biogeography deals with organic phenomena, whose principle is physiological, and its purpose vital, based on heredity and adaptation to environment; and economic geography treats of super-organic phenomena, whose principle is psychic rather than physical, and its purpose utilitarian. Heretofore, biogeography and economic geography have not been adequately distinguished, and many facts due to economics are still explained by biology. By use of the terms 'organic' and 'super-organic' an advantageous distinction is made. Organic evolution means the survival of the fittest species, the adaptation to environment by a passive process which pre-

serves the species and provides for its propagation, and which is dependent on the tendency to variability. The subject matter of organic evolution is the influence of environment upon the physiological evolution. Super-organic evolution is quite different. Its object is the success of the most efficient institutions and depends upon the use of goods. Its subject matter is the effect of environment upon utilization, but it is an active process in which man adapts nature to his needs. The science of economics supplies the principle of utility to explain the satisfaction of human wants, while geography shows the process of utilization. The supply of goods is, to a certain extent, limited. Human wants are, however, quantitatively satiable, but qualitatively insatiable. The efforts of man to supply his wants bring him in contact with the conditions of his environment. As different environments give different potential utilities, there result differences in methods of production and manner of consumption, and in the resulting customs, standards, and degrees of civilization. When the economic law of diminishing returns sets in, economic ingenuity devises new ways of using the environment. Life must be recognized as a constant struggle of man with outer nature and a competition with his fellow men—a struggle necessarily directed by geographic conditions.

Economic geography does not merely locate mountains and rivers, or describe products, but shows their effect upon civilization. Nevertheless, full and adequate descriptions are required. The following plan is suggested: (1) General topography, giving boundaries and the natural divisions of a country into economic units, not political divisions; (2) orography, a study of highlands and lowlands and their effects upon climate and products; (3) hydrography, the sea-coast, rivers, and lakes, with their facilities for commerce; (4) meteorology or climate; (5) oromatology, including (a) minerals, (b) flora, and (c) fauna; finally, an historical and contemporaneous description of the country, showing how the people have adjusted themselves to this environment, and what institutions have been developed. In this way the backwardness of Africa, the locations of early civilizations, or the quick development of New Zealand or America by civilized immigrants can be explained.

The claims made for the study of economic geography are that it makes economics an exact and concrete science, and serves the cause of education by giving a knowledge of the resources of the earth in their historical application to human wants, by indicating the actual economic evolution, and by making possible the application of abstract economic principles.

The material for study is found in periodicals, scientific and Government reports, compendiums, accounts of travelers, and existing geographies.

GEOGRAPHY, COMMERCIAL. This subject is a branch of economic geography from which, as indicated above, it cannot be completely differentiated. The phases of economic geography that as yet are most commonly taught in the schools of the Old World and the New are usually presented under the name of commercial geography. All the text-books written in English, German, French, and Italian, dealing largely with the relations between economics and geography and used in the commercial schools, are called commercial geographies. All authors dealing with

commercial geography assert, in the language of one of them, that it "treats of the many influences operating all over the world which promote or retard the production, transportation, or exchange of the commodities, natural or manufactured, which man consumes or utilizes," a definition which the most voluminous writer on this subject says is an expression of the scope of the topic that could hardly be improved. It has to do with the world-wide distribution of the economic factors that affect commerce, whether these factors relate to production, to transportation, or to supply and demand.

This is the province of commercial geography, accepted under that name in the five distinct grades of commercial schools in Germany, where commercial education is most highly developed: primary commercial schools (*Kaufmännische Fortbildungsschulen*); commercial schools (*Handelsschulen*); advanced commercial schools (*Höhere Handelsschulen*); classified commercial courses (*Handelsfachklassen*); and commercial universities (Leipzig and Cologne). The reports collected by the British Foreign Office on the provisions made for the technical training of boys and young men destined for a commercial career in all countries show that commercial geography, with text-books of that name, is a part of the commercial courses also in France, Great Britain, Austria, Belgium, Switzerland, Holland, Italy, Denmark, Sweden, Norway, the United States, and Japan. The business colleges of the United States have given some instruction in this subject for many years, but it is only since the recent introduction of commercial courses in the public schools that widespread attention has been directed to commercial geography. The study has been introduced into a large number of the high schools and into the highest grade of the grammar schools, the idea being that it is not wise to neglect commerce and industry in the public educational systems. The subject is also studied in the Commercial High School of Philadelphia, and is to be introduced into the Commercial High School (building, 1903) of New York City. The special need in the United States, as yet, is a sufficient number of teachers who are well trained in commercial geography. This lack will, in time, be supplied by such institutions as the universities of New York, California, Pennsylvania, Michigan, Wisconsin, and Chicago, which are giving to commercial geography its due importance in their schools of commerce, that are designed to supply the technical training required by teachers in the lower schools.

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GEOGRAPHY, MEDICAL. See **DISTRIBUTION OF DISEASES.**

GEOLOGICAL SOCIETY OF AMERICA. An organization for the promotion of the science of geology in North America, formed in 1888 as

an outgrowth of the geological section of the American Association for the Advancement of Science. The society is almost strictly professional, with a membership of about 300. The organization issues the *Bulletin of the Geological Society of America*.

GEOLOGICAL SURVEY, UNITED STATES.

The United States Geological Survey, a bureau of the Department of the Interior, is charged with the investigation of the geological structure and mineral resources of the country. The bureau was organized in 1879 as a consolidation of the independent surveys that had been active for several years in exploring the Western States and Territories. In 1867 Clarence King organized a geological expedition for the examination of a belt of country including the fortieth parallel, and extending across the Rocky Mountains from Wyoming to California. In the same year the General Government commissioned F. V. Hayden, who had previously been attached as scientist to exploring parties in the West, to make a survey of Nebraska. The exploration of territory west of the one hundredth meridian and of the Colorado basin was provided for by the Government in 1871, and the expeditions were placed under the direction of George W. Wheeler and J. W. Powell. The four organizations, popularly known as the King, Hayden, Wheeler, and Powell surveys, fulfilled an important mission in the scientific investigation of a vast and little known territory. As the scope of operations was extended, however, it became evident that the work could be conducted to better advantage under a uniform system. A plan for unifying the service was proposed by the National Academy of Sciences and finally adopted by Congress in 1879, when the independent surveys were discontinued. The control of the new organization, known as the Geological Survey, was placed in the hands of a director, who was required to submit an annual report of plans and operations of the Survey to the Secretary of the Interior.

The functions of the Geological Survey, as originally outlined by law of Congress, with subsequent modifications, include the preparation of a topographic map of the United States; the investigation and mapping of the areal geology; the examination of mineral deposits; the collection of mineral statistics; the study of hydrography with reference to water-power and the irrigation of arid regions; and the classification of public lands. The preparation of the topographic map, a necessary preliminary to the geologic and hydrographic work, is carried on by the topographic branch of the Survey. At the beginning of 1902 a total area of 895,673 square miles, or 29 per cent. of the entire area, exclusive of Alaska, had been surveyed upon scales of one, two, and four miles to the inch, varying with the importance of the different regions. When completed the topographic map will give an accurate presentation of the surface features of the country. The geologic branch of the Survey investigates and maps the geological formations. The map, as rapidly as completed, is issued in folios; it shows the areal distribution of the various rocks, their geological structure, and the location of mineral resources. For the purpose of conducting special investigations of scientific or economic value, the geologic branch is organized in divisions, each of which covers a particular field.

The divisions are here given as illustrating the general scope of this work: Areal geology; Pleistocene geology; pre-Cambrian and metamorphic geology; metalliferous ores; non-metalliferous products; paleontology; mining and mineral resources; physical and chemical research. The results of the work along these varied lines have been the accumulation of much new information relative to geological science and the furthering of the material interests of the country. The publications issued by the Geological Survey for general distribution include the director's report (annual), monographs, bulletins, and special papers. Consult Walcott, *The United States Geological Survey* (Washington, 1895).

GEOLOGY (from Gk. γῆ, *gê*, earth + -λογία, -logia, account, from λέγειν, *legein*, to say). Geology is the science which investigates the history of the earth. The rocks of the earth's crust contain the records of this history. Many of the pages of the rock book are lost, others are obscured through partial destruction, and many, like the hieroglyphics on ancient monuments, require great care, patience, and intelligence to decipher; yet, in spite of these difficulties, we are already in possession of a vast fund of information concerning the history of the earth.

Geological study shows that forces similar to those of the present have been operating in the past. Therefore to interpret properly the past history presupposes a knowledge of the forces working at the present time to modify the earth. One class of forces, depending upon energy from within the earth, causes the earth's surface to rise and fall, volcanoes to erupt, and the rocks to be disturbed; another, deriving its energy from without the earth, and mainly from the sun, sets in operation winds, waves, rain, rivers, glaciers, and tides, which wear away the surface of the land and distribute the waste in the oceans. The effect of life on the globe is another geological factor. Many geological changes are influenced by animals and plants. It is of great importance, therefore, that in many instances the layers of rock forming the crust contain remains of animals and plants of past ages. The study of these original remains has given much information concerning past life and the conditions amid which the life existed. Moreover, since life has developed in ordinary succession, the study of the fossils of animals and plants has given a basis for the division of the earth's history into periods, or ages.

Although geology stands as a distinct science, with numerous subdivisions, to master it thoroughly requires a broad knowledge of several allied sciences. Botany and zoölogy are indispensable to the student of fossils; physics and chemistry, to the student of rocks; and astronomy and geography, to all who would broadly grasp the subject of geological history. Each of these sciences furnishes tools with which the geologist works out the varied and complex earth history.

FUNDAMENTAL PRINCIPLES OF GEOLOGY. Geological work is so slow, and the evidence of vast changes in the past so clear, that, so long as it was held that the age of the earth was to be reckoned in a period of a few thousand years, no other conclusion was possible than that the changes observed had been rapidly made as a result of stupendous catastrophes. Thus the early literature of geology deals largely with

imagined deluges, sudden upliftings of the crust to form mountains, destructive invasions of the land by ocean water, and similar catastrophes. When, however, it was made clear by Hutton and his successors that the recorded facts indicated slow changes, it began to appear possible that the age of the earth was great. The promulgation of the doctrine of evolution, and the increased knowledge of past life, as recorded by the fossils, brought further evidence of the great age of the earth. In consequence of these advances in science, the interpretation of the former history of the earth by modern geology rests upon two principles that may be considered established: one that *the age of the earth is very great*; the other, that *in the processes in operation at present, we may look for illustrations of most of the changes of the past*. These two principles were formulated in the doctrine of uniformitarianism (q.v.) which was proposed as a substitute for the older theory of catastrophism (q.v.). By this doctrine the past may be investigated in the light of the present. Given time enough, even the slow processes operating at present, which produce no perceptible change in one's surroundings in a lifetime, will accomplish the stupendous results so clearly proved by geological study.

AGE OF THE EARTH. The evidence from geology all points toward an age for the earth to be reckoned in millions of years. One line of evidence upon which this conclusion is based may be illustrated as follows: there are, in some places, great accumulations of rock layers which were deposited in the ocean. These layers are known to reach a depth of many thousands of feet, in some instances over 40,000 feet. A study of these beds indicates that they were accumulated slowly, as similar beds of limestone, clay, sand, and gravel are now being accumulated in the sea. If anything like the present rate prevailed, the time required for their formation is very great, probably not less than 100,000,000 years. This estimate is, of course, open to doubt because of the question whether the past and the present have been so closely alike; but even if this doubt is warranted, the deduction must still be made that the age of the earth is very great. From a study of the wearing away of the land, and the planing down of mountains, a similar conclusion may be reached. A second class of evidence pointing to a great age for the earth is supplied from a study of the fossils preserved in the rocks. The evolution of plant and animal life seems, in general, to have been gradual, as it is in the present time; and this conclusion harmonizes with the evidence from the rocks themselves.

Physicists have also estimated the age of the earth in several ways. One of these estimates is based on the rate of cooling of the heated interior of the earth. Another estimate is based on the effect of the tides in retarding the rotation of the earth by the friction of the tide wave. Still a third line of argument is based upon the rate of cooling of the sun, whose light, according to Lord Kelvin, will not last more than five or six million years longer. The facts concerning the earth's heat, the sun's heat, and the earth's form, together with the rate of cooling of the sun and the earth and the effect of tidal friction, have led Lord Kelvin and other physicists to the conclusion that the age of the earth is not greater

than 20,000,000 years. Great though this estimate of time is, it is not great enough to satisfy geologists; for the evidence from geology seems to point to a far longer history for the earth.

From what has been said, it is evident that we are not in a position to state even approximately the age of the earth in years; but all lines of evidence agree in pointing to the conclusion that geological time is to be reckoned in millions of years; and geologists are practically unanimous in the belief that the time since the oldest stratified rocks were deposited cannot be much less than 100,000,000 years.

THE BRANCHES OF GEOLOGY. Investigation of the earth's history may be carried on along various lines; in fact, geology is so complex a subject that it is now no longer possible for one man to claim to have a thorough knowledge of the entire subject. Consequently, it has come to be the custom to subdivide geology into several branches. Some of these branches are quite universally recognized; in the case of others there is difference in usage.

(1) **COSMICAL GEOLOGY.** In this branch are included investigations in the borderland between astronomy and geology. It is a consideration of the relations of the earth to the other members of the solar system and to other bodies in space. As archaeology is related to history, so is this phase of cosmical study related to geology proper.

(2) **GEOGNOSY.** This division of geology includes a study of the materials of which the earth is formed—air, water, minerals, and rocks of the crust—and of the condition of the earth's interior. The study of minerals to determine their composition, crystal form, and other characteristics is the province of the science of mineralogy, which has chemical and physical, as well as geological, relationships. The study of rocks forms the science of petrology or lithology. Petrography, a branch of geology recently developed, is concerned with a study of rocks from the standpoint of their composition, characteristics, and geological relations.

(3) **DYNAMIC GEOLOGY.** Under this heading is included a study of the operation and effects of the forces that are and have been at work to modify the earth.

(4) **STRUCTURAL GEOLOGY.** This division of geology is concerned with a study of the architecture of the earth. That is to say, structural geology investigates the actual arrangement of the materials that are included under geognosy as they have been placed by the forces of dynamic geology. Using the parallel of architecture, the crude materials are included under geognosy; the arrangement and position of these materials, and their relation to one another, are included under structural geology; the forces that have formed the materials and arranged them, and the way in which they have operated to do it, form the theme of dynamic geology.

(5) **PHYSIOGRAPHIC GEOLOGY.** This division deals with the forms assumed by the surface of the land as a result of the operation of the dynamic forces upon the materials and structure of the earth. Extending the parallel of architecture to this division, it is to geology what the finished building is to architecture. This division of geology is coming to be considered a separate science of physiography or geomorphology.

(6) **STRATIGRAPHIC GEOLOGY.** Historical geology is a term often applied to this division, because it is more intimately connected with a study of past histories than any other of the divisions. By a study of the life record inclosed as fossils in the strata, and by a study of the rocks themselves and their structural relations, stratigraphic geology tells of many of the great events in earth history. One of the most important phases of this line of study relates exclusively to the investigation of the life record. This may be called paleontological geology. But now the broader students of stratigraphic geology make use not only of paleontology, but of dynamic, structural, and physiographic geology to determine not merely the life record, but also the physiography of past ages. Thus considered, it is one of the broadest divisions of the science.

(7) **GLACIAL GEOLOGY.** One of the latest events of stratigraphic geology was the general glaciation of different parts of the world. The study of the events of this time, which necessarily includes a study of existing glaciers, has attracted a large number of geologists, so that glacial geology has come to be recognized as a distinct branch of the science.

(8) **ECONOMIC GEOLOGY.** The geological processes have resulted in the accumulation of many useful materials—soils, clays, building-stones, and metallic minerals. The study of these from the standpoint of their occurrence and origin constitutes economic geology.

COSMICAL GEOLOGY.

A full treatment of this phase of geology is out of place in a brief general article. Moreover, much of it belongs to astronomy. Studies of the shape of the earth, and the resemblances between the earth and other bodies in space, both in form and composition, are undertaken by physicists and astronomers. These studies, however, throw light upon the earliest phases of earth history, pointing to the conclusion that the earth, like other bodies in space, was once a molten sphere which has cooled on the outside, forming a solid, cold crust. Of the original crust geological investigation has as yet found no sign. It is to the continued cooling of this once molten sphere that we owe some of our most important geological events. The forces, having their seat in the heated interior, may be considered as *terrestrial* or *hypogene forces*. The passage of light and heat to the earth, the great movements of rotation and revolution, and the pull exerted by the sun and moon, constitute the *extra-terrestrial* or *epigene forces*, which, aided by gravity, and acting through the medium of air and ocean, set in motion another series of geological agencies. Dynamic geology is concerned in a study of the operations of these two sets of forces whose origin is cosmical.

Other phenomena of the earth having an influence on geological history are the precession of the equinoxes and the variations in the eccentricity of the earth's orbit. These two astronomical changes have influenced the amount and distribution of heat on the earth's surface in past times, but to what extent is an unsolved problem. There are still other obscure questions in cosmical geology; for example, the possible changes of the earth's axis and centre of gravity. Being on the borderland of two or three sciences, and dealing with subjects on which it is difficult

to gather facts, these are among the great scientific problems awaiting solution.

GEOGNOSY.

The earth consists of three quite different sections, the solid earth itself, or the lithosphere; a partial water cover, or the hydrosphere; and a gaseous envelope, the atmosphere. Each of these has its geological bearings.

THE ATMOSPHERE. The atmosphere consists of a mixture of gases, of which the most important are oxygen and nitrogen in the proportion of 21 per cent. of oxygen to about 79 per cent. of nitrogen, argon, and other similar elements recently discovered. The nitrogen is inert, the oxygen very active, not only in its influence on life, but also in its effect on rocks. A minute percentage of carbon dioxide, about 0.03 per cent., is of basal importance to plant life. A variation in the percentages of these three constituents would produce a very great difference in the effect of the air. Water vapor is present in variable quantities in the air, and its condensation causes the rain upon which springs, rivers, and lakes depend. There are also minute solids, called dust particles, and very small quantities of a large number of other substances, as salt, nitric acid, ammonia, etc. (See **ATMOSPHERE**.) By its influence on life the air is of the highest geological importance. It also affects rocks directly, causing them to oxidize and disintegrate; and the movements of the air, in the form of wind, produce direct geological results, as well as indirect ones by the agency of waves and currents which are wind-driven. A consideration of the geological effects of the air forms part of dynamic geology.

THE OCEAN. Filling the depressions between the continent upfolds are the oceans, reaching a depth in some places of five or six miles. Altogether, about three-fourths of the earth's surface is covered with ocean water, with an average depth of over two miles. This great hydrosphere is disturbed by tidal waves, ocean currents, and wind-waves, which are important agents of dynamic geology. As a modifier of climate, and as the source of the water vapor in the air, it is also of geological importance. In the ocean water many substances are held in solution, the dissolved solids constituting about three and one-half parts to every one hundred parts of water. Of these dissolved substances, over three-fourths are common salt and one-tenth is chloride of magnesium. A minute proportion of carbonate of lime is the basis for the limey shells and tests which have so often accumulated to form beds of limestone. As the home of shell-building animals whose remains form rock beds, and as the seat of deposit of waste from the land, the ocean is of the very highest geological importance. See **OCEAN**.

THE CRUST OF THE EARTH. The cold, outer portion of the earth is composed of rocks, some derived from beneath the surface, whence they have risen in molten condition, others formed by the reasortment of the materials obtained from the disintegration of other rocks. These rocks have been subjected to movements, as a result of which the earth's surface has been made irregular. The cause of these movements of the crust depends upon the heated condition of the earth's interior: the results have been to make great downfolds where the ocean basins are situated and

upfolds where the continents are located, with numerous minor uplifts and downsinkings along narrow lines, both in the sea and on the land, forming mountain ranges. (See **CRUST OF THE EARTH**.) By far the greater part of the earth's surface is fairly level. Most of the ocean bottom is a vast series of submarine plains with occasional mountain ranges and volcanic peaks rising above them. On the land much more than half the surface is also plain or plateau, some of the plateaus rising to elevations of 10,000 to 15,000 feet. See **CONTINENT**.

In the ocean the deposit of waste from the land, and the accumulation of the solid parts of animal remains, has the general tendency to level the sea floor. Agents of erosion are in general ineffective excepting at the contact between land and sea; and consequently the only forces operating to make the sea floor irregular are those of uplift or downsinking of the crust. On the land, on the other hand, the action of the forces of denudation carves the mountains, plains, and plateaus, making the surface more irregular. And along the coast-line the work of the waves and tides is added to the dynamic processes by which the land is being irregularly denuded. Thus the land portion of the earth's crust is often deeply scarred and cut, revealing the internal structure of the superficial portions of the crust.

INTERIOR OF THE LITHOSPHERE. Early geologists considered the interior of the earth to be molten, basing their conclusion upon a number of facts pointing to a high temperature for the interior. The numerous hot springs indicate heated conditions below the surface; all deep borings and mines show a rise in the temperature with increasing depth; and volcanoes actually bring melted rock to the surface. The movements of the crust also may be accounted for by assuming a heated interior, which upon cooling and shrinking allows the cold, solid crust to settle on it and wrinkle. If the observed increase in temperature in mines and borings, which averages one degree for every 50 to 60 feet of descent, is continued far into the earth, temperatures must eventually be encountered which are above the melting-point of rocks at the surface.

Astronomers and terrestrial physicists have shown, however, that the earth cannot be a molten sphere with a thin crust. In its behavior toward other members of the solar system the earth acts like a solid body, and one as rigid as steel. If there is a solid crust it must be at least 2500 miles thick. The evidences for this conclusion are obtained not only from the behavior of the earth toward other members of the solar system, but also from the absence of tides which would be present in a molten interior, and from the fact that the average density of the earth is far greater than that of the rocks at the surface, indicating a very dense, heavy interior.

Geological facts also point toward the conclusion that the earth's interior is not molten. Consequently geologists have long accepted the hypothesis of a solid heated interior, so hot that it would be molten under normal conditions, but kept from melting by the enormous load of the crust, since the melting-point of rocks is raised with an increase in pressure. Whether there is a zone of molten rock between the solid cold crust

and the solid heated interior is not known. Many believe that the rock of the interior is molten only where the pressure is relieved by the uparching of the crust under mountain folds. The condition in which the heated rock exists in the interior is one of the fundamental problems of geology still awaiting solution.

ELEMENTS AND MINERALS OF THE EARTH'S CRUST. Relatively few of the seventy or more elements form an important percentage of the crust. Oxygen, the most abundant element of the outer portion of the earth, constitutes 86 per cent. of the ocean, 21 per cent. of the air, and 47 per cent. of the crust. Nitrogen, though forming about three-quarters of the air, is of little importance in the ocean or the rocks. Silicon forms 27 per cent. of the crust, and aluminum 8 per cent., so that the three elements oxygen, silicon, and aluminum together constitute 82 per cent. of the crust. Next in importance are the following: iron, 5; calcium, 4; sodium, potassium, and magnesium, each about 2.5; carbon, 0.22; hydrogen, 0.21; phosphorus, 0.1; sulphur, 0.03; and chlorine, 0.01 per cent.

These elements, combined according to definite chemical laws, form minerals. A great variety of different combinations are known, making, in all, over 2000 mineral species. Most of these are rare, and only a very few form prominent contributions to the crust. Of these common minerals, by far the most abundant is quartz, made of the two common elements silicon and oxygen. Its hardness and indestructibility make it a factor of strength in rocks. Probably next in abundance is the group of feldspars, of which a number of different kinds are recognized. Although hard minerals, the feldspars disintegrate in the weather, forming clay and certain soluble substances. Calcite is a third common mineral, composed of calcium, carbon, and oxygen. Being both soft and easily dissolved, calcite is an element of weakness in rocks. Dolomite, the magnesium carbonate of lime, has similar characteristics to calcite. Other common rock-forming minerals are the micas, amphiboles, and pyroxenes, all complex silicates of aluminum with potassium, magnesium, iron, etc. Gypsum, the hydrous sulphate of lime, and the several oxides of iron—limonite, hematite, magnetite—the carbonate of iron, siderite, and the sulphide of iron, pyrite, are other common minerals. Of these or their decayed products the great part of the rocks of the crust are made. These minerals are of high geological importance; the others are of interest especially to the mineralogist and the petrographer. See MINERALOGY; QUARTZ; FELDSPAR, etc.

ROCKS OF THE EARTH'S CRUST. Minerals, combined in various ways, form rocks. Sometimes the combinations are according to definite chemical laws; but rocks are usually mere aggregates of several minerals. A three-fold division of the rocks may be made as follows: *igneous*, or those derived from a molten condition; *sedimentary*, mainly sediments in water; and *metamorphic*, or those due to the alteration of other rocks by heat and pressure.

The igneous rocks vary among themselves in two characteristics, one chemical composition, the other texture, and the classification now generally recognized is based upon this double variation. From different volcanic vents, the lava differs chemically, in the one extreme being very

acid, that is, with much silica; in the other being very basic, that is, with a small percentage of silica and a large percentage of the basic elements, iron, magnesium, potassium, sodium, etc. These chemical differences give rise to different classes of minerals—quartz and feldspar prevailing in the acid rocks, micas, amphiboles, pyroxenes, and iron oxides in the basic. According to the conditions of cooling, the igneous rocks vary in texture. Some are blown out by violent explosive expansion of steam, and, cooling quickly, form glassy, porous pumice and volcanic ash. In other cases flowing lava cools so rapidly that it sets without the formation of individual minerals, forming natural glass, or obsidian. More commonly the lava becomes crystalline, and is either fine-grained or has a fine ground mass inclosing large porphyritic crystals. Many igneous masses do not reach the surface, but cool in the vent of the volcano, or, being intruded into the rocks, cool in the crust. These cool so slowly that the elements crystallize into good-sized individuals, producing coarse-grained rocks like granite, syenite, etc.

The term *sedimentary* for the second class of rocks is not perfectly satisfactory, since not all the rocks included are sediments. The group comprises mechanical deposits, such as conglomerate, sandstone, and clay, which are derived from preëxisting rocks by the processes of disintegration and erosion, and are removed and deposited by air, water, or ice; chemical deposits, accumulated by the precipitation of materials held in solution, and including rock salt, gypsum, calcareous tufa, etc.; organic deposits, such as limestone, chalk, marl, coal, and bog iron ore, which are formed by the growth and decay of animal and plant organisms.

Either igneous or sedimentary rocks, under the action of heat and pressure, are subjected to changes which in some cases go so far as to remake the rock entirely. This alteration, or metamorphism, sometimes takes the form of crushing, accompanied by the development of new minerals; in other cases there is a development of new minerals without noticeable crushing. This formation of new minerals may go so far as to destroy entirely all evidence of the original characteristics of the rock, as in many schists and gneisses. The new minerals naturally develop with their long axes along the lines of least resistance, thus giving to the rocks a parallel structure; and it is due to this feature that slates split readily in one direction, namely, parallel to the cleavage planes of the micaceous minerals. By metamorphism, also, limestone is often changed from amorphous carbonate of lime to crystalline calcite, forming marble. Sandstone is changed to dense quartzite by the deposit of silica around the grains. Coal is changed to anthracite by the expulsion of volatile substances, causing the concentration of carbon; and in some cases this metamorphism has gone so far as to produce crystalline graphite, which is pure carbon. For details as to origin, composition, and classification of rocks, see the articles on PETROLOGY and ROCK.

DYNAMIC GEOLOGY.

Dynamic geology is a conflict between the hypogene and epigene forces. The hypogene forces raise some parts of the earth's surface into the air and lower other parts beneath the ocean;

the epigene forces attack the parts thus raised and tend to spread over the sea floor the materials derived. The epigene forces may be grouped under the general heading of denudation. So far the forces of uplift have been more potent than those of denudation, and the land surface is battered and scarred by the conflict; but should the forces of uplift cease, or so lose in effectiveness that denudation was more rapid than uplift, the land would slowly lose in ruggedness, and the surface would be reduced by denudation to a more and more level condition. In discussing the scope and principles of dynamic geology we will first consider the hypogene forces.

CHANGES IN THE LEVEL OF THE LAND. Among the most far-reaching results of geological study is the proof that the earth's surface is not stable at the present time, and that a similar condition has existed in all periods of the past. Again and again stratigraphic geology tells of changes in land-level of stupendous nature; and studies in dynamic geology have proved that similar changes are now in progress in many parts of the world. In some places the movement is an uprising of the land, in others a down sinking; and these movements in some cases affect broad areas of the crust in a slow uprising or down sinking, while in other cases the movement is localized and spasmodic. These latter movements are usually associated with mountain growth, earthquakes, or volcanic eruptions, and over a limited area the level of the land may change several inches, or even feet, in a few minutes. The movements affecting large areas are so slow that careful study is necessary to prove their existence.

Many instances of land movement now in progress might be given. The coast-line of New Jersey is sinking at the rate of about two feet a century; the coast of Labrador is rising at an unknown rate; the coast of West Greenland is sinking; in Sweden, records of 150 years show that the region south of Stockholm is sinking, while to the north the land is rising, in one place having risen seven feet in that period. Local rapid movements of the land were observed in Japan during the earthquake of 1891; changes of level, both uprising and down sinking, have occurred in the Bay of Naples; the coast of Chile has been uplifted during earthquakes in the last century. Evidence of changes of level in past ages is furnished by elevated beaches, raised beaches that are no longer horizontal, and submerged forests. The irregular coast-line of parts of continents, as in Northeastern America, is interpreted as a drowned coast, where, by land sinking, sea-water has been allowed to enter the valleys, forming floods. In some cases the continuation of the land valleys may be traced along the sea bottom, as in the case of the Hudson River (q.v.).

The question has naturally been raised as to whether these changes are due to land movement or to changes in sea-level. Some of them, as in Sweden, where the movement is differential, and the spasmodic movements in limited areas, are certainly due to land movement. With regard to others, the conclusion is not so certain, though the geological evidence all points toward a change in the land rather than of the sea.

The cause for the instability in the crust is believed to be the heated condition of the earth's interior. Various hypotheses have been proposed to account for the exact manner in which this

heated condition causes change in level. The most currently accepted hypothesis is that of contraction, by which it is held that, through loss of heat, the interior is shrinking, and the crust, in accommodating itself to the shrinking interior, is caused to move. Another hypothesis is that of isostasy. This explains crust movement by assuming that variations in the load on the crust cause movements. The reduction of load by denudation of the land and the increase of load in places of sedimentation necessitate an isostatic readjustment, causing sinking in one place and rising in another, as there would be in a pile of wax of irregular height. This hypothesis assumes a plasticity for the earth which many geologists are not willing to accept. Other hypotheses have also been proposed, but space forbids their discussion here.

MOUNTAIN FORMATION. The stresses brought about in the earth's crust through the energy which is causing change in level, whether this be due to contraction, isostasy, or other cause, throw the surface into a series of folds, the largest forming the continental uplifts and ocean depressions, the smaller forming mountain chains. According to the contractional hypothesis the general movement of the crust is a down sinking, but locally portions are uplifted because the solid crust cannot accommodate itself to the shrinking interior without wrinkling. The great pressure thus applied to the rocks, operating through long periods of time, causes them to bend or break. Where the rocks which are subjected to these stresses are deeply buried, and hence under great pressure, they bend, even though they are brittle rocks. When the strain is more quickly applied, or when the rocks are nearer the surface, faulting is common; and thick beds of brittle rocks, like sandstone or limestone, are more liable to break than thin-bedded rocks such as shales. See **FAULT**.

All evidence points to the conclusion that the formation of mountains in the past has been slowly accomplished. Indeed, some mountain chains, such as the Andes and those of the East Indies, the Philippines, and Japan, are now growing and apparently little if any more slowly than the mountain growth of the past. It is found by a study of the structure of mountains that in most cases their growth has been intermittent; that is, periods of freedom from uplift have occurred. Many of the mountain chains are along lines of crust weakness established in the early periods of geological history. Along these lines the stresses have relieved themselves at various times so that these regions have remained mountainous throughout geological time. On the other hand, many parts of the crust have been marked by entire freedom from mountain-folding. The zones of mountain growth extend in a general north and south direction in many parts of the earth, as in Western North and South America, Eastern North America, and Eastern Australia. A belt of shorter ranges, with east and west axes, extends across the Old World in the north temperate zone. Many efforts have been made to find a system in the arrangement of the mountains of the globe and to account for their distribution, but no thoroughly satisfactory theory has been evolved. See **CONTINENT**; **MOUNTAIN**, etc.

VOLCANIC ACTION. Molten lava, rising from within the earth toward the surface, sometimes

reaches the surface, but often rises into the crust and remains there. Small masses filling cracks in the rocks are called dikes; masses thrust in between the layers of the strata form sills or intruded sheets, like the Palisades of the Hudson; still larger masses, which lift the rock and form great wells of lava, are called laccoliths; and huge masses, with irregular boundaries, common in the cores of mountains, are known as bosses. Instances of each of these classes of igneous rock have been revealed by the denudation which has stripped off the overlying strata.

Where the molten rock reaches the surface it usually rises through a fissure; and when the volcanic energy is vigorous, as it was during the formation of the mountains of the Western United States, the lava may well out through these fissures, and form vast floods which inundate great areas on either side of the fissure. Hundreds of thousands of square miles in the West are covered by these ancient lava floods. In no part of the world is this form of fissure eruption well developed at the present day, though the volcanoes of Iceland approach this type.

The geological effects of volcanic eruptions are of very great importance. The heat of intruded masses causes change in the rocks with which they come in contact. By the outflowing of the lava extensive changes are made in the topography, and highly important, though usually destructive effects, are produced on life. Much rock material is added to the crust, mostly near the volcanoes, in the form of ash and lava flows, but partly as intrusions into the crust and partly as deposits, on the land and in the sea, derived from ash drifted about by the air and water currents. See VOLCANO; LACCOLITE.

EARTHQUAKES. The eruption of volcanoes is frequently accompanied by a shaking of the earth; and the rising of lava into the crust and the movements of the lava before an eruption also cause earth jars. Likewise, a breaking of the rocks, or a movement of the strata along a fault plane, causes earthquakes. Indeed, any jar to the rocks, even the explosion of gunpowder or the falling of a cavern, will produce an earth-

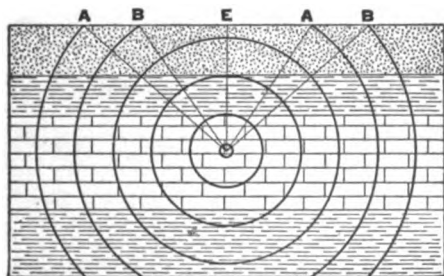
quake from this centre. Irregularities of rock texture and structure interfere with the regularity of these variations. The propagation of the earthquake wave is shown in the accompanying diagram, where E represents the epicentrum and A B coseismal curves.

Among the geological effects of earthquakes the destruction of life is best known; but the shaking of the ground sometimes changes the topography, shaking loose earth about, and opening fissures in the ground and rocks. When the earthquake originates under the sea a great water-wave is raised. This, advancing on neighboring shelving coasts, so increases in height as to wash over the lower land with highly destructive effects. These earthquake water-waves have an important influence on sedimentation in certain places; and the jarring of the sea floor and the ocean water sometimes causes a great destruction of life, which aids in the formation and preservation of fossils. If the jarring is too frequent, however, the tendency is toward extinction of life in the region subjected to the jarring. See EARTHQUAKE.

HOT SPRINGS AND GEYSERS. Water is everywhere percolating through the upper layers of the crust. Reaching fissures, it often rises to the surface, forming large and permanent springs. This water is frequently heated in its passage, sometimes through the influence of heat-producing chemical changes in the rock; sometimes deriving its heat from rocks whose temperature has been raised by the friction caused by slipping along fault planes; sometimes being warmed by the presence of intruded masses of lava. The time required for the cooling of great masses of intruded melted rock is so great that hot springs and geysers might be caused by them for many centuries.

The heated waters take many mineral substances into solution in their passage through the rocks. On reaching the surface this is often evident in the deposits made near the outlet as the water cools. For example, the geysers of the Yellowstone precipitate silica, the hot springs carbonate of lime. Many hot springs have medicinal properties because of the minerals in solution. A great variety of mineral matter is carried by the hot water and even veins of precious metal are formed by it. See GEYSER; THERMAL SPRING.

FORMATION OF ORE DEPOSITS. Heated water under pressure in the rocks is a potent chemical reagent. It soon becomes alkaline or acidic from substances derived from the rocks, and in this condition dissolves and changes minerals in a complex way. As it circulates through the crust the condition of this water is constantly changing; growing warmer or cooler; receiving accessions of water from different sources; and obtaining various substances from the rocks through which it passes. Under these changing conditions mineral substances may be dissolved in one place only to be subsequently deposited elsewhere. Nor is the activity confined to highly heated water. The surface waters descending through the rocks also dissolve and deposit, as is illustrated especially well in certain deposits of iron ores. However, the conditions most favoring the formation of mineral veins are the presence of heated water and of cavities in which the deposit can be made. Of cavities the most important are fault planes and



EARTHQUAKE WAVE.

quake shock. The jar, originating at a point, or along a plane, is transmitted through the rocks as a series of waves moving outward in spherical form from the centre, or focus. At the epicentrum, directly above the focus, the wave movement is upward; on all sides from the epicentrum it reaches the surface at an angle, departing more and more from the vertical as distance from the epicentrum increases. The violence and the time of appearance of the shock vary in all directions

fiissures. Since these are most abundant in the mountain regions, and since mountains most commonly have associated igneous phenomena by which the water is heated, such regions are especially favorable for mineral deposit. In addition, the igneous rocks contain the greatest store of the metallic elements, and hence their presence is important as a source of supply of the metals. All these conditions prevail in the mountainous sections of the Western United States, one of the great mineral regions of the world. See ORE DEPOSITS.

METAMORPHISM. The phenomena of mountain building and igneous activity are favorable to that alteration of rocks which is included under the term metamorphism. Heat, heated water, and great pressure are effective in changing the character of rocks. This alteration may be local, through contact with intruded masses of igneous rock, when it is called contact metamorphism; or it may be widespread, through intense and extensive mountain-building, when it is known as regional metamorphism. In each case the resulting changes are similar, though the alteration is usually carried to a far greater degree in regional than in contact metamorphism. Metamorphism has also been subdivided, according to the agency which has predominated, into hydrometamorphism, thermometamorphism, and dynamometamorphism.

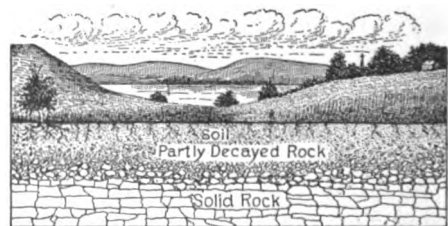
All rocks in a region of metamorphism are involved, and the resulting changes are independent of the origin of rock, being determined by the nature of the metamorphism and the composition of the rock subjected to the change. Sometimes the alteration is so complete that no trace is left to tell the original character of the rock, not even the general class to which it belonged; and there are some geologists who believe that in some cases metamorphism has been carried to the extreme of actual melting, or, at least, to the reduction of the rock to a plastic condition. On the other extreme, some rocks are so slightly altered that their original condition is easily recognized; for example, pebbles of conglomerate, elongated and stretched out of shape, are sometimes found; bedding planes in some of the slate are still observable crossing the planes of cleavage; distorted fossils may be present; and beds of marble may be traced to their origin from limestone strata, or quartzite to a previous condition of sandstone. The genesis of even the highly metamorphosed schists and gneisses may at times be traced by following along the beds to some less intensely metamorphosed section containing fossils, or other indications of their origin. Thus it is known that some of the highly altered beds of metamorphic rocks in the Alps were deposited in the Tertiary sea and metamorphosed during the building of the Alps in late Tertiary time. See METAMORPHISM.

WEATHERING. Of an entirely opposite character to metamorphism is that change in rocks which results from contact with the air. In the processes of metamorphism the materials of rocks are rearranged, and in most cases bound more closely together; in the processes of weathering the materials are weakened and the rock caused to disintegrate and fall apart. Weathering, like other geological processes, is a complex phenomenon resulting from a cooperation of various agencies. Most of the agencies of weathering operate both chemically and mechanically.

Air aids in the weathering of rocks by supplying oxygen, carbon dioxide, and other substances for chemical changes. Through the wind it performs mechanical work. Heat and cold, by causing contraction and expansion, aid in the breaking up of the rocks. Percolating waters cause many chemical changes, especially by the aid of oxygen from the air, carbon dioxide from air and decaying vegetation, and organic acids, derived from plant decay. Mechanically, water is important when the rain-drop strikes the ground; and when frost is formed in soil and rocks, the expansive force rends the materials apart with great effect. Plants are also important, both chemically and mechanically. Chemically they work by obtaining plant food from the earth, mechanically by the intrusion of their roots in soil and rock. Burrowing animals are likewise effective agents of weathering, especially the ants and earthworms, which bring fresh materials to the surface, and make the soil more porous.

The effectiveness of the agencies of weathering varies with the nature and situation of the rock. All rocks are entered by water; but some are far more porous than others. Some minerals are easily soluble, some insoluble; some decay with ease, others are quite indestructible. But even the densest rock, made of the most indestructible of minerals, will crumble, though slowly, in the weather. On steep slopes, as on mountain tops and cliffs, the bare rock is exposed to the weather by the aid of gravity which removes the fragments as they fall; but on more level ground some of the weathered material remains as a blanket, protecting the rock from some of the agencies of weathering. Arid lands are unfavorable places for weathering, because of the general absence of water. A forested country is protected by the forest cover, and it is probable that this protective effect is of more importance than its destructive effect. In damp tropical regions rock decay is of most importance; in cold climates frost is one of the most important agencies.

Of the effects of weathering, by far the most important is the disintegration of the rock to form soil. Whenever the slope is not too steep the



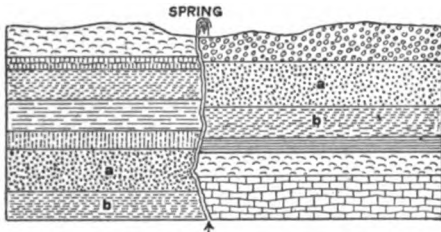
RESIDUAL SOIL.

disintegrated fragments accumulate as soil cover. Such a soil of rock decay is called a residual soil, because it is a residuum of mineral decay after all the easily soluble portions have been removed. By far the greater part of the land has a soil cover of this origin. A second highly important effect of weathering is the preparation of rock for transportation, and were it not for weathering the geological history would have been far different. The rock waste falls or is washed into the streams which use it as tools for carving valleys, as the material for building flood-plains and deltas, and as contributions to

the deposits of sediment which are made in the sea.

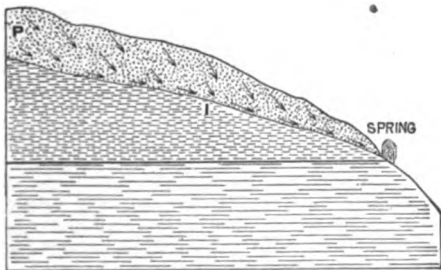
WIND WORK. As an agent of geological change the importance of the wind is not fully recognized by dwellers in humid regions. Aside from its influence in weathering mentioned above, the wind does effective work in two classes of regions, namely, in arid lands and on seacoasts. In both places the protective covering of vegetation is absent; and in both places fine-grained rock fragments are dried and exposed to the wind. In these positions the sand is borne about by the wind and piled into irregular hills or dunes. The friction of the sand particles over one another grinds them down; and, when blown against rocks and cliffs, a natural sand-blast is in operation, with the result that the rocks are worn away. An additional effect of wind action is the construction of land in the sea. Where sand-bars are thrown up by the waves, or where coral beaches are built on coral reefs, the wind completes the construction of land by building dunes of the fragments washed ashore. The blowing of sand and dust out to sea adds to the sediments gathering there. The distribution of volcanic ash over wide areas is another important geological effect of the wind. Indirectly the wind is exceedingly potent as the transporter of vapor for rain, and as the force which causes the waves and currents in the ocean. See **WIND**; **DUNE**; **LOESS**.

WORK OF UNDERGROUND WATER. Water is ever percolating through the rocks of the crust, and this underground water is an effective agency of



SPRING ALONG FAULT PLANE.

dynamic geology. Much of this water returns to the surface after a short journey, and it is this which with rain keeps the rivers supplied. Wells show its general presence in the surface rocks, and springs are places where favorable condi-

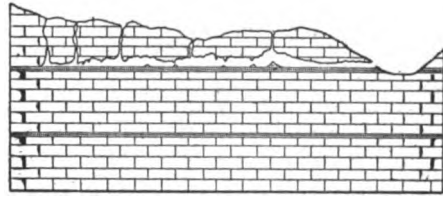


SPRING ON HILLSIDE.

P, porous rock; I, impervious strata.

tions have conspired to direct quantities of it back to the air. Among these favorable conditions are fault joint planes and relatively impervious layers. The percolation of water along such lay-

ers when they rest in unstable positions is an important cause of landslides. Where rocks, such as limestone, are made of minerals that are soluble, the passage of water usually dissolves out underground channel ways. Along the joint and bedding planes the rock is slowly dissolved away, the water entering from sink-holes at the



FORMATION OF CAVE IN LIMESTONE.

surface and emerging as springs on some valley side into which the underground water is draining. These caverns are often ornamented with stalactites and stalagmites, caused by the deposit of carbonate of lime which the water must precipitate on emerging from the rock into the cave air. See **CAVE**.

RIVER WORK. In draining from the land the water carries a load of mineral matter in solution and in suspension. The former is mainly supplied from the underground water, though some is obtained from the river bed. The suspended material is in part derived from the inwash of soil by the rains, in part from materials obtained by weathering of the valley sides, and in part by the direct work of the rivers, using the rock materials as tools of excavation. There is a great variation in the work which rivers are doing. Some have such a rock load, on so gentle a slope, that they cannot cut, but must build up their beds. Others are rapidly excavating their beds and have cut deep gorges and canyons, which they are still deepening. Their rate of work varies with the volume of water, the slope, the nature of the rock, and the amount and nature of the load of rock waste being transported. Since the rate of work varies with the kind of rock which is being excavated, rivers that are engaged in deepening their valleys are liable to have falls and rapids because of variations in rock texture.

One of the great geological results of this river work is the formation of valleys. Where a stream is rapidly cutting, its valley is narrow and steep-sided. Even in this case the valley is broader than the stream, partly because, by its meandering course, the river undercuts its bank, and partly because weathering is broadening the valley. Weathering continues even after the stream has ceased its down-cutting, and therefore the valley continues to grow broader and broader, the stream removing the materials which this weathering supplies. Thus as a transporting agent rivers, in coöperation with weathering, which prepares and supplies the materials, are important factors long after they have ceased to cut directly into the rock.

In the transfer of the waste of the land to the sea some of the material halts on the way. Even the most rapid of streams, bearing the coarsest of fragments, furnish illustrations of this in their beds, in bars, and in narrow strips of deposit on their margins. The larger streams, especially near their mouths, are often bordered

by flood-plains in which sediment is laid aside in flood time and in which, as the stream slowly changes its course by meandering, portions are being taken up on the side of cutting while other portions of the river load are being deposited on the opposite side. Such flood-plain deposits are built of fine-grained fragments, making a very fertile soil. See **EROSION**; **VALLEY**; **FLOOD-PLAIN**; **DELTA**; etc.

THE WORK OF LAKES. Lakes are formed by some interference with drainage, usually a dam across some stream course, as the growth of a mountain barrier, a lava flow, or a dam of glacial deposit. The lake waves work on the coast-line; cliffs are cut, beaches are formed, and on these the fragments are ground finer. The rivers which enter the lake add still more to the deposit accumulated, forming deltas where they enter, but giving the finer material to the currents for transportation off into the lake. Weathering adds to the supply of sediment, and the wind drifts more rock fragments to the water. In the quiet lake waters, even the finest of this sediment in time settles to the bottom. Given time, then, the fate of lakes is to be filled; and the truth of this has been graphically stated in the remark that "rivers are the mortal enemies of lakes." But rivers are not allowed to do the entire work of lake destruction, as has been shown. Aside from the agencies of lake-filling mentioned, the influence of organisms is effective. The shells of animals and the accumulations of plant remains are also factors of importance. In the last stages of lake destruction water-loving plants—the reeds, rushes, and sphagnum mosses—are effective, both by their own accumulation, and by their interference with waves and currents, thus aiding in the deposit of rock fragments. Many filled lakes have been transformed by plant growth to bogs in the northern climates, where the sphagnum moss grows readily. By the processes of lake-filling important accumulations of sedimentary rocks are made; and in some countries, as the Western United States, where large lakes were formed behind mountain dams in recent geological periods, there are extensive areas occupied by lake-formed strata. Coal-beds, representing the stages of organic influence, are a part of these lake beds. In arid climates, where evaporation exceeds the rainfall, the lake waters are lowered below the outlet; then, year by year, the mineral substances brought in solution by the incoming water, and left behind in the lake as the water is evaporated, become more and more concentrated. Such lakes become salt, and, if the process continues, deposit layers of salt, gypsum, and other substances. Before this stage is reached, however, the precipitation of carbonate of lime takes place because salt water dissolves this substance less easily than fresh water. Beds of these precipitated rocks are common in the West, where they have been recently formed, and, in fact, are in some cases still forming; they are also found among the strata of earlier ages when similar conditions existed. See **LAKE**.

GLACIER WORK. Glacier action at present is confined to high mountains and high latitudes. There are two classes, valley, or alpine, and continental. Of the latter Greenland and the Antarctic furnish illustrations; and during the Glacial period (q.v.) continental glaciers covered Northwestern Europe and Northeastern America.

Hence glacial action assumes wider importance than it would if considered solely from the standpoint of the work of present glaciers. The erosive action of glaciers seems to be very great where the ice movement is free along valleys. The weight of the ice, pressing its grinding tools on the under rock and slowly dragging over it, grooves and polishes the rock and deepens as well as broadens the valleys. The results of this work are readily seen in a region from which vigorous ice action has disappeared. The material dragged along by the ice is a mixture of large and small rock fragments in various stages of reduction by the grinding process. At the ice front, or when the ice melts away, this material is released and, falling to the ground, accumulates as an unsorted mixture of materials, because the ice carried large and small fragments with equal facility. This glacier deposit is known as till or boulder clay. If the ice front stands long enough along a single line the accumulation of ice-borne debris forms a moraine. The melting of the ice releases much water along the front and this water assort a portion of the till, causing clay deposits in one place, sand and gravel in other places. By the glacier-borne floods large quantities of rock fragments are carried far away from the ice front and deposited in the river valleys, and even borne to sea. Where glaciers enter the sea there is a direct contribution of material to the ocean; and by means of the icebergs which break from the glaciers some of the rock fragments are carried far to sea. The deposits made directly by the ice, and by water supplied by ice melting, cover Northeastern America and Northwestern Europe, forming the soil of those regions. These glacial deposits vary greatly in form and in texture according to the exact nature of the formation; and they vary also in depth. Many important effects have been produced by these deposits, especially on the drainage. The great number of lakes in Europe and America are mostly due to some form of glacial interference with drainage; and the gorges and waterfalls are due to the turning aside of streams by glacial deposits. See **GLACIER**; **BOULDER CLAY**; etc.

OCEAN WORK. The most powerful agent of erosion in the ocean is the wind-wave. By its direct blow, and by hurling and grinding rock fragments together, waves are wearing coast-lines back. From the cliffs thus formed much material is supplied by weathering, which is assisted by the influence of the salt and other soluble substances with which the rock is sprinkled by the ocean spray. The waves, approaching the coast diagonally, drift the rock fragments along the coast, and this movement is further aided by the wind and wave-formed currents. These fragments often find lodgment in embayments, forming beaches. Such beaches are mills in which the rock fragments are further ground down. The finer fragments obtained by the waves, added to those brought by the rivers, the wind and weathering agencies, are in part drifted out to sea by the undertow, the wind-formed currents, and the tidal currents. Rarely the tides have an erosive influence; but with ocean currents and ocean drifts they are important transporting agents. The currents and drifts are also geological factors in modifying climate, and in bringing food to sea-animals. The materials derived from the land by the various agencies are strewn

over the sea bottom near the land, the coarsest near the coast, the finest out to sea. Sometimes the sediment comes to the sea in greater quantities than the agencies of the ocean are able to remove. Then they accumulate as bars along the coast and the waves expend their energies on the bars, leaving the protected coast behind the bars untouched. If the sea bottom is sinking, great beds of conglomerate, sand, and clay may be accumulated; if it is rising, the beds previously formed are added to the land, as along the Eastern United States south of New York. More than half of the rocks of all the continents were formed on subsiding sea beds near land areas and made of the land waste. Later they were elevated to form parts of the continents and they have often been built into great mountains, such as the Alps, Appalachian, and Rocky mountains.

In the sediments accumulating on the sea floor animal remains are always present; and as the distance from the coast increases these become of increasing importance because of the diminution of the supply of rock waste. Far from the coasts, in the open ocean, the contributions of land waste are so slight that the sea-floor deposit is made almost exclusively of animal remains, especially of the tests of minute surface animalculæ which have dropped to the sea floor. This forms an ooze, variously named from the animal forms predominating. Of these the most numerous are usually the Globigerina, low forms of Foraminifera. Chalk beds are made of Globigerina ooze, raised to the surface and consolidated. In the very deepest oceans only the insoluble residue of these shells continues to the bottom, forming a red clay deposit. In this clay are found also volcanic dust, meteoric iron, and the ear-bones of whales, indicating its extremely slow accumulation. About one-third of the sea floor is covered by red clay, and one-third by ooze; yet red clay is not found on the continents, and ooze rarely. This seems to indicate a permanency of the deep ocean basins, and that the ocean-formed rocks of the land were mostly made in those shallow parts of the ocean which bordered the continent areas.

Organic influences are not confined to the deposits of the deep sea. Grass-like plants, and, in tropical regions, mangrove trees, are effective in aiding deposit on many coasts, especially in protected spots. Shell-building animals also form deposits in addition to contributing to the elastic sediments. But far the most important of the coastal organic influences are those of the corals, which build reefs along the coasts, and islands on shoals in the sea. The coral fragments are built into islands by uplift, by waves and winds; and coral ooze is strewn over the sea floor near the reefs by the grinding of the waves and transportation by the currents. By these means beds of limestone are being accumulated. See OCEAN; DEEP-SEA EXPLORATION; CORAL ISLAND.

WORK OF LIFE. As a geological agent life is important in many respects, and reference to life has already been frequently made. It helps to disintegrate rocks, to transport fragments, and to make deposits of rock materials. All forms of life have geological influence; and man, the highest and most powerful of the animals, has come to be one of the most important of the geological agents. By modifying and destroying animals and plants; by removing the forests; by interfering with rivers, lakes, and oceans; by excavations

in the ground; and by many other actions, man is aiding in geological change, and in a way more varied and effective than any other organic agency.

DENUDATION. The land uplifted by continent movements, mountain-building, and volcanic activity is being attacked by the agents of denudation. The rocks are dissected, the land made irregular, and the fragments carried to the sea. Mountains are planed down, volcanoes removed to their very roots, coast-lines cut back, and the structure of the upper parts of the crust revealed. Thousands of feet have been removed from all of the continents and new land has been made of the fragments deposited in the sea and then lifted to the air by the forces from within the earth. The work of destruction by the agencies of denudation is partly repaired by uplift. A study of the form of land resulting from this interaction of uplifting and down-cutting belongs to physiography (q.v.).

STRUCTURAL GEOLOGY.

The rocks of the crust, considered under the three headings of sedimentary, igneous, and metamorphic, present certain characteristic structural features. When in the form of flows the igneous rocks are arranged in layers, and they are often covered with beds of sedimentary strata.



INTRUDED SHEET OF IGNEOUS ROCK.

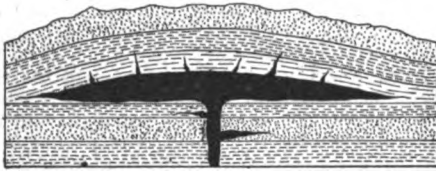
Sheet-like intrusions of lava are also in beds. But dikes, bosses, and laccoliths are more irregular. These igneous rocks vary in texture, as has been already stated. Joint planes are commonly present, being due to contraction of the cooling masses which results in a breaking of the rocks. These joints at times assume almost mathematical regularity, as in the hexagonal columnar jointing of Fingal's Cave and the Giant's Causeway. Many of the metamorphic rocks inherit some of the characteristics of the rock from which they were derived. But when highly metamorphosed they become massive and crystalline, resembling in this respect the igneous rocks.



BOSS OF INTRUDED ROCK (B).

However, owing to the influence of pressure, the metamorphosed rocks are characterized by a banding, often very marked. Veins are common in the metamorphic rocks, and the layers are often highly contorted under the strain of the tremendous pressure to which they have been subjected. Joint planes of later origin are also present. The sedimentary strata are character-

ized by arrangement in layers due to the assorting action of the agencies which have caused their accumulation. This assortment is found both on a very small scale, represented by lami-



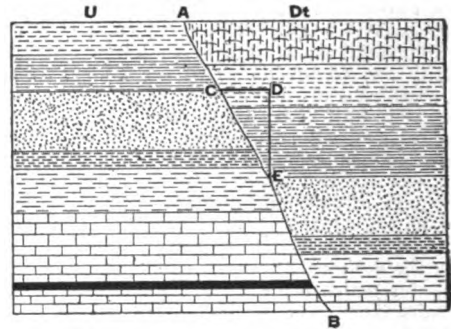
LACCOLITE.

næ, and on a large scale, represented by changes in the nature of the material. For example, a series of shales, with many laminæ, may grade downward to a sandstone and upward to a limestone. The minor variations represent the influence of slight variations in the force or direction of currents or in the nature of material supplied; the larger changes indicate more extensive changes, such as uplift or depression, which completely alter the conditions under which the sedimentation is taking place. A shallowing means coarser fragments, a deepening finer fragments, because of change in the position of the coast-line. The sedimentary beds are lens-shaped because they die out in all directions; but the beds of coarser fragments, having less extent, are more lens-shaped than those made of finer fragments.

The structure of sedimentary rocks often reveals the manner of origin. Coarseness indicates nearness to shore; limestone indicates abundant life; and the presence of currents, varying in velocity and direction, is indicated by cross, or current, bedding, in which the layers vary greatly in coarseness and in the direction and angle of inclination. This form of bedding is caused by river, wave, and wind currents. Ripple-marks, rain-prints, footprints of land animals, and mud-cracks, formed by the cracking open of mud exposed to the sun, are also commonly found, indicating shallow-water origin for the deposits. From such evidence a remarkably large proportion of the sedimentary beds are known to have been formed in shallow water. While most of the rocks included in the sedimentary group are deposited as fragments, and hence are at first unconsolidated, the sedimentary strata of the land are mainly consolidated. This consolidation is usually the result of the deposit of some kind of cement by percolating water. Carbonate of lime, some sort of iron, and silica are the common cements. The presence of cementing materials in the ground water is illustrated by the replacement of woody matter by silica, forming petrified wood. At times this cementing material gathers around centres, such as grains of sand or fossils, forming concretions.

Aside from the bedding planes, the sedimentary rocks, as well as the other groups, are crossed by joint planes, which, with the bedding planes, cause the rock to break naturally into rhombic or cubical blocks, greatly aiding in quarrying operations. Most of the jointing in sedimentary strata, and much of that in the igneous and metamorphic rocks, seems to be due to disturbances in the rock, which cause strains. Under violent strains the rocks are often folded and faulted, especially among mountains. This folding is

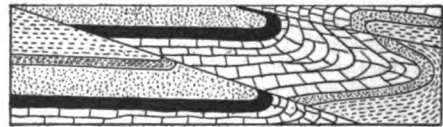
sometimes very complex and amounts to real contortion. A single fold, with a dip in but one direction, is called a monocline; the ordinary up-arching of rocks is known as an anticline, and the downfolding as a syncline. These may be symmetrical or unsymmetrical, and in some cases



FAULT.

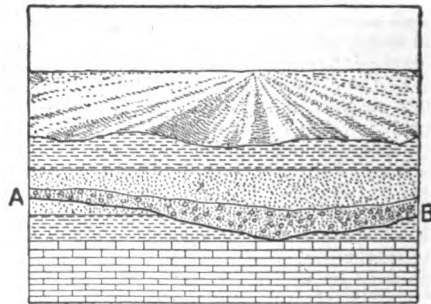
A B, Fault Plane; D E, Throw; U, Upthrow; Dt, Downthrow.

are even overturned or recumbent. Under favorable conditions the rock under strain breaks in place of bending, forming faults. Some of the



OVERTHRUST FAULT.

faults are dislocations of only a few inches, some of thousands of feet. Ordinarily the plane of faulting is approximately vertical, but in some cases, as when folds are overturned and the fold-



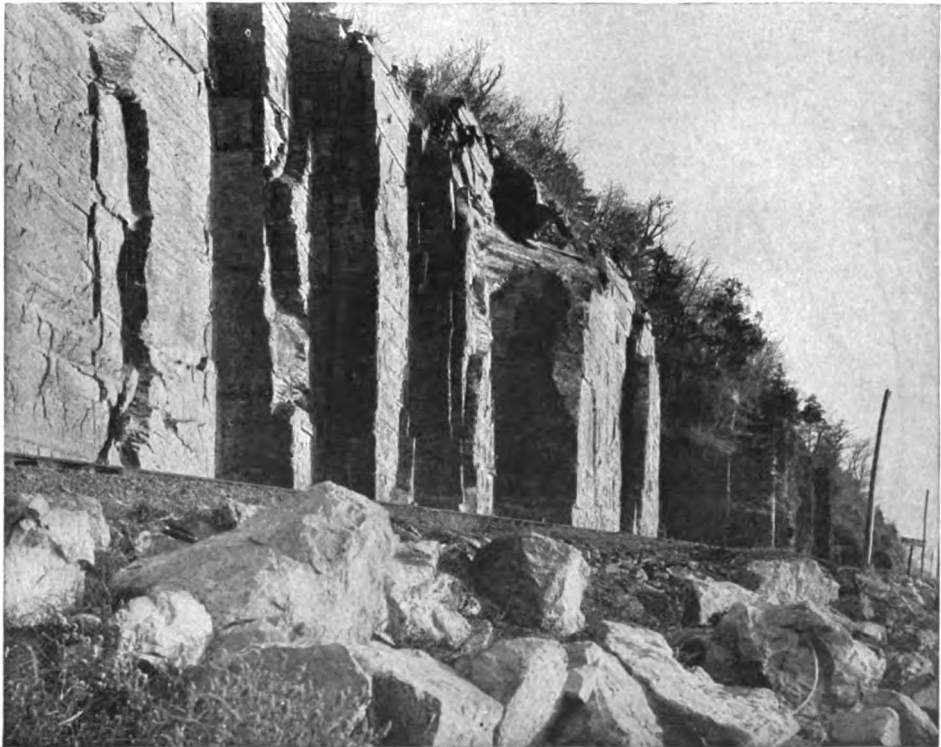
UNCONFORMITY.

A B, Between two series of horizontal sedimentary rocks.

ing continues to the point of breakage, faults are developed with nearly horizontal planes. Such faults are called overthrust faults, and the plane a thrust plane, because the rocks on the upper side are thrust over those on the lower side.

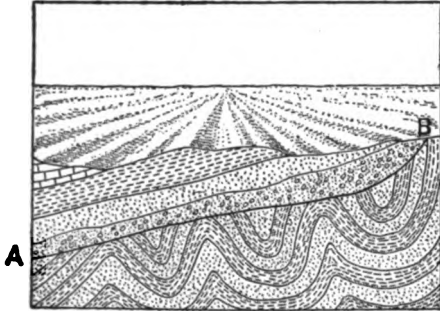
Ordinarily the sedimentary strata are horizontally deposited in the sea; and when lifted to form a part of the land they are usually still approximately horizontal. With mountain disturbance, however, the rock layers are thrown into inclined positions. In plains and plateaus, on the other hand, the rocks are prevailingly

GEOLOGY



ANTICLINAL FOLD, CHESAPEAKE & OHIO CANAL, NEAR HANCOCK, WEST VIRGINIA (UPPER)
JOINT-PLANES IN ROCKS NEAR ITHACA, N. Y. (LOWER)

horizontal and there is little disturbance. Owing to the volcanic activity accompanying mountain formation, and to the great pressure under which the strata are placed in folding, both volcanic and metamorphic rocks are common among mountains, but are rarely found in plains. By reason of the instability of the earth's crust, land is often lowered below sea-level subsequent to a period of denudation. Then sedimentary deposits are laid down on the submerged surface, after which the area may be raised once more into land. The plane between the new deposit and the old land marks an unconformity, and the upper rocks are said to rest unconformably upon the lower. An unconformity thus represents a gap in rock formation and in the life record, and



UNCONFORMITY,

A B, between sedimentary rocks and a series of folded rocks.

is often of great use in interpreting geological history. See JOINTS; ANTICLINE; SYNCLINE; DIKE; FAULT; etc.

PHYSIOGRAPHIC GEOLOGY.

This branch of geology is specifically treated under the heading of **PHYSIOGRAPHY**, so that only the general principles will be here stated. Physiography is concerned with a study of the forms assumed by the surface of the crust and the origin of these forms. Both on the ocean bottom and on the continents, plains, mountains, and volcanoes have been built, and each of these crust forms has a history. This history may start with the origin—the plain is an old lake bed, or a raised sea bottom, or a lava plain, etc. After its origin changes of one kind or another have occurred, giving it its present modified characteristics. For example, rivers may have developed upon it, or the agencies of the sea may be at work upon it, or glaciers may have passed over it. It is a question of physiographic geology to decide what has happened since the origin of a given land form.

In recent years, largely as a result of the work done by Professor Davis, it has been found that land forms normally pass through a life history which can be stated in terms of youth, maturity, and old age. The characteristics of a newly formed coast-line, a young stream valley, or a mature plain are readily seen. These aspects of physiography may be considered briefly by a few examples. A young stream has steep sides, because there has not been time enough for weathering to broaden them; it is certain to have falls or rapids, if the rock texture is irregular, because it has not yet established a grade, and is therefore busily cutting in its bed and discovering rock

irregularities; it may have lakes, because there has not been time enough for the rivers to fill them; and its tributaries are liable to be few and its divides poorly developed, for want of time. A mature stream has lost these characteristics. It has many tributaries and well-defined divides, but no waterfalls, excepting possibly in the head-water regions. Lakes are absent, and the valley is broad and its side slopes moderate. This is the normal development; but accidents may occur to interfere with this development. For example, lava floods may cross the valley or fill it; glacial deposits may be laid down to embarrass the stream; and the land may be raised or depressed. A mountain or a plain, or any other land feature, when newly formed, and hence young, will have, therefore, certain characteristics; but with increasing age these will be changed. For example, drainage, at first vigorous, will dissect the land form, making it more irregular. A plain may then become a hilly region, and a mountain chain will become very rugged. Weathering and erosion will later reduce the irregularities, causing the mountain to become more level and the plain once more to approach a level condition. See **PHYSIOGRAPHY**.

STRATIGRAPHIC GEOLOGY.

The fossil organisms, whose study forms the basis of paleontology or biogeology, in connection with a study of the rocks themselves, are useful in telling of past changes in climate and physical geography. But perhaps their most important service to the geologist is as factors in the determination of the geological age of the rocks. Their use in this respect depends upon two important principles—one that the strata are normally found in the order of their deposition, the oldest below, the highest above. This is known as the law of superposition of strata. The second principle is that, in the evolution of life on the globe, there has been a general upward progression. A knowledge of the nature of this progression, therefore, makes it possible, by a study of the fossils of given strata, to tell in what stage of life development they lived, and to assign an age to the strata in which they are found. The use of the term age in this connection naturally does not mean years. A term like the Devonian period might be considered to represent in geological history what the term Bronze Age means when applied to human history. It refers to a stage of life development.

Prior to the enunciation of these principles by William Smith about a century ago, there had been various attempts to classify the strata. An early attempt employed the three terms Primary, Secondary, and Alluvial. A later attempt elaborated this time division as follows: Primitive, Transition, Secondary, Tertiary, and Alluvial. In the classification at present widely in use, the term Tertiary is still employed, and Secondary is occasionally met in the writings of geologists of a few years ago. At one period lithological data were used in classifying the strata, on the assumption that at certain periods widespread conditions permitted the general deposit of rocks with certain lithological characteristics. Thus there was a Carboniferous period or age of coal; an Old and a New Red Sandstone period; a Cretaceous, or Chalk period; an Oolitic period, etc. Several of these inherited terms are still in use even now that it is known that lithological char-

acteristics were not universal. With the introduction of the life record it was found possible to define periods of geological history with more definiteness, often placing their boundaries at unconformities which marked a break in the preservation of the life record, thus making a good dividing line. This study has led to the necessity for the introduction of new names and the abandonment of some of the old ones. Very commonly the new names are geographic—Devonian, from Devonshire, England, and Permian, from Perm, Russia, for example—being adopted from the region where the study necessitating the new name was made. The use of fossils has also made it possible to subdivide the larger divisions of geologic history, and the names thus introduced are usually geographical and of local significance. Thus, those of Texas differ from those of New York, California, India, or England. But the large divisions are of world-wide application. The following table gives the names commonly in use in America for the main divisions:

DIVISIONS OF GEOLOGICAL TIME

Cenozoic.....	{	Quaternary	{ Recent. Pleistocene. (Glacial period.)
		Tertiary.....	{ Pliocene. Miocene. Oligocene. Eocene.
Mesozoic.....	{	Cretaceous	{ Upper Cretaceous. Lower Cretaceous.
		Jurassic.	
		Triassic.	
Paleozoic.....	{	Carboniferous	{ Permian. Coal Measures. Sub-Carboniferous.
		Devonian.....	{ Upper Devonian. Middle Devonian. Lower Devonian.
		Upper Silurian or Silurian.....	{ Lower Helderberg. Onondaga. Niagara.
		Lower Silurian or Ordovician.....	{ Trenton. Canadian.
	{	Cambrian.....	{ Upper Cambrian. Middle Cambrian. Lower Cambrian.
Archaean.....	{	Huronian (Algonkian, United States Geological Survey).	
		Laurentian (Fundamental Complex, United States Geological Survey).	

In a given region a broad statement of the stratigraphic geology would start with the oldest rocks, perhaps the Archaean, and continue down to the present. It would treat of the fossils, their characteristics, variations, and associations, and it would include a study of the structure, position, and relations of the rocks themselves. These studies would be applied to an interpretation of the history of the region, both in general and in detail: The evolution of life; the climate and its variations; the relation of sea and land, and their variations in relation; the nature of sedimentation and the conditions accompanying it; the geographic conditions and the changes in past geography, with causes; periods of volcanic activity and their effects; the growth of mountains and their reduction; in a word, all the many and complex changes and interactions and interrelations of conditions which have helped to make the geological history. It is such a complicated subject that no adequate abstract is possible in an article of this scope. In fact, stratigraphic geology, being a history of the past,

differs for each locality, and can be properly discussed only in treatises on geology. Much on stratigraphic geology is, however, given in various articles on specific topics. See PALEONTOLOGY; PALEOBOTANY; ARCHÆAN SYSTEM; CAMBRIAN SYSTEM; SILURIAN SYSTEM; etc.

GLACIAL GEOLOGY.

One of the last great episodes in geological history was the advent of great ice sheets from northern lands, invading and overwhelming Northeastern America and Northwestern Europe. Because of its recency (in the Pleistocene period), the record of this invasion is clear. It lowered the hills, deepened the valleys, scoured, grooved, and polished the rocks, and transported soil and boulders in its onward march, leaving them in complex deposits when it melted back. These deposits clogged the valleys, turning streams aside and causing them to carve new valleys, which are now gorges with rapids and falls, and by making dams across the streams many lakes were ponded back in the stream valleys. In its advance the ice sheet drove out both animal and plant life, and many interesting effects on life were produced. A study of these records, and an interpretation of the events which they record, is the province of glacial geology.

The time of coming, the length of duration of the ice invasion, and the length of time since its withdrawal, are not known in years. From 5000 to 30,000 years is the estimated time since the withdrawal of the ice—probably nearer the former than the latter. The duration of the ice invasion was many times the length of the Post-Glacial period, and was great enough for a large amount of work to be performed. The beginning and the end of the Glacial period are included in the Pleistocene, so that even the time of coming is a recent geological event, being post-Tertiary. There is increasing evidence that the Glacial period was complex, consisting of several ice advances, with intermediate periods of deglaciation, or interglacial epochs.

Much discussion has arisen on the question of the cause of the Glacial period, without, however, arriving at definite results. That the land in the glaciated regions at the beginning of the Glacial period was higher than now is demonstrated; and it seems certain that, could the land be once more raised to that elevation, glaciation would again set in. The land is now rising again in the glaciated region, and the query may well be raised: Are we living in an interglacial period? See GLACIAL PERIOD.

ECONOMIC GEOLOGY.

A great number of geological products have economic value, and our industrial development of the present time is dependent upon these products. The investigation of these from the standpoint of their occurrence, origin, and uses belongs to the economic geologist. Of the topics of economic geology, undoubtedly the most important is the soil. Its origin, distribution, variations in texture and chemical composition, and the means of bettering it and of properly utilizing it, are questions of high importance. Building products—the building-stones, cement materials, and clays—form a second important group; mineral fuels, including coal, natural gas, and petroleum, a third group; and metallic

products, including both the precious and baser metals, form a fourth group. Besides these, there are many lesser products—the precious stones, abrasive materials, salt, gypsum, fertilizers, etc. The number of industries dependent upon this varied list of geological products, and the vital relation of several of them to modern civilization, show the value of a thorough and scientific knowledge of the nature and cause of their occurrence. It is the importance of this economic aspect of geology that has led governments, both State and national, to support expensive geological surveys. For a scientific study of economic geology, other aspects of geology must also be considered; consequently the whole field of geology has profited from the need of study of the economic aspect. See ORE DEPOSITS; MINING.

THE HISTORY OF GEOLOGY.

Geology ranks as one of the youngest of the sciences. In the latter part of the eighteenth century the discussion was being waged with warmth by Hutton and his followers on the one hand, and Werner and his followers on the other hand, as to whether any but the most recent igneous rocks were to be ascribed to other than aqueous agencies, as Werner affirmed. Catastrophism was rampant, and articles on that phase of natural philosophy which dealt with the earth history were mainly philosophical polemics defending some hypothesis. The clergy took a share in the discussions, opposing any theory of earth history which seemed at variance with the then existing dogmas of theology. It had not yet come to be the custom in the natural sciences to gather facts patiently, weigh them carefully, and endeavor to draw logical conclusions from them. Rather it seems to have been the custom to take such facts as appeared, philosophize upon them, and defend the conclusions with vigor against all comers and all fact.

James Hutton, in 1785, sounded the first note of the new geology when he said that he saw "no traces of a beginning, no prospect of an end." This generalization, now a foundation stone of the geological structure, was based upon a wide and thoughtful study and upon many carefully gathered facts. In Playfair's *Illustrations of the Huttonian Theory* are to be found many of the principles of modern geology. A second great epoch in the history of geology was the work of William Smith, at the close of the eighteenth century. As has been stated above, his work made possible the division of the geological record into ages based upon scientific principles. His work, therefore, stands as the foundation of stratigraphic geology. The work of Hutton and Smith made it possible for others to follow, and quickly facts began to accumulate and conclusions to be drawn which gave to geology the right to be considered as a separate science. Sir Charles Lyell, sometimes called the founder of modern geology, gathered these results and added to them his own, putting them together as a system in his *Principles of Geology*, still a geological classic. He vigorously promulgated his system, and was, without doubt, the greatest and most effective of geological teachers.

In these earliest days of geology as a science Americans had but little share; but before the middle of the century James Hall, James D.

Dana, and others were vigorously at work on the geology of the North American continent. State geological surveys were established in many of the States; Government geological expeditions and surveys were started; and, finally, the present United States Geological Survey was organized. Another event of great importance in the history of geology was the announcement of Agassiz's glacial hypothesis. Prior to his announcement floods, and then floods with icebergs, relics of the earlier days of catastrophic geology, were appealed to in explanation of the phenomena of the drift. Aside from its importance for the science of glacial geology, which it originated, Agassiz's doctrine of a glacial period was important as the destroyer of the last remnant of catastrophism from geological science. Henceforward uniformitarianism was accepted, and, for a while, perhaps too thoroughly accepted and too blindly followed, as a result of Lyell's energetic advocacy. No longer was there any belief in the performance of geological work in a limited period of time; but moderate uniformity and great lapse of time were firmly established principles. Perhaps to Darwin's doctrine of evolution, which Agassiz did not accept, is due the final establishment of the principle of a great lapse of geological time. Be this as it may, the promulgation of the doctrine of evolution was an event of great importance to geology, which made advance in certain phases of geology possible. This theory was based in part on paleontological evidence, and geologists took a large share in its establishment. The discussion which followed its announcement resembled in some respects the discussion on geological philosophy at the end of the preceding century.

Out of the old natural philosophy have come several sciences, and out of each of these have developed several divisions, or subspecies, some of which may be classed as distinct sciences. The field of geology is so large, and its problems are so varied, that, as the body of fact gathered by the army of workers has increased, it has become necessary to subdivide; and, as in all sciences, the tendency is ever toward narrower and narrower specialization. The generation of geologists now passing away could be familiar with the whole field, as their teachers could be naturalists, and theirs natural philosophers. In one sense this is unfortunate, but in others it is for the best, because with specialization the details of knowledge are best gathered. Some day a geological Darwin will appear with large enough grasp of the subject to arrange the facts patiently gathered in the various fields, and to see their bearing on the great and still unsolved problems of geology.

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terly Journal of the Geological Society (London). The leading German periodicals are: *Neues Jahrbuch für Geologie, Mineralogie und Paläontologie* (Stuttgart), and *Zeitschrift für praktische Geologie* (Stuttgart).

GE'OMAN'CY. See SUPERSTITION.

GEOMETRICAL OPTICS. See LIGHT.

GEOMETRIC MEAN. If three quantities, a , b , c , are in geometric progression, b is called the geometric mean between a and c ; e.g. 2, 4, 8 are three such numbers, 4 being the rate, and 2 is the geometric mean. From the nature of the series

$$\frac{a}{b} = \frac{b}{c}, \text{ or } b^2 = ac, \text{ and } b = \sqrt{ac}.$$

The positive value of the square root is usually, but not necessarily, taken as the geometric mean when a and c are positive, the negative value being taken when a and c are negative—e.g. the geometric mean between 2, 8 is $\sqrt{16} = +4$, but between $-2, -8$, it is $\sqrt{16} = -4$. The several terms of a geometric series which lie between two numbers, as a , l , are called the geometric means between a , l . The geometric mean of n positive real quantities is the positive value of the n th root of their product—e.g. the geometric mean of 8, 27, 64 is $\sqrt[3]{8 \cdot 27 \cdot 64} = 24$.

GEOMETRIC PROGRESSION. See SERIES.

GEOM'ETRID MOTH. A moth of the family Geometridæ, whose caterpillars are called inch-worms, loopers, measuring worms, or spanworms. The family name ('ground-measurer') refers to the peculiar method of locomotion of these caterpillars. The geometrids form one of the largest divisions of the Lepidoptera, scattered over all parts of the world, characterized by slenderness of body and the absence of tufts or crests on the thorax; the wings are usually light-colored, with intricately variegated markings, but some species are distinctly marked with bright colors. They are of medium or small size. For an account of the caterpillars, see MEASURING WORM.

The caterpillars of the geometrids are among the most destructive pests of tree foliage and garden plants, as is described in the accounts of such species as the canker-worm, gooseberry-worm, raspberry-worm, etc. A magnificent monograph of the American geometrids, by Dr. A. S. Packard, was issued as volume x. of its quarto publications by the United States Geological Survey in 1876; it contains thirteen colored plates and gives all American species then known.

GEOM'ETRY (Lat. *geometria*, from Gk. *γεωμετρία*, *geometria*, from *γεωμετρῆς*, *geōmetrēs*, geometer, from *γῆ*, *gē*, earth + *μέτρον*, *metron*, measure). The science of form. Geometric concepts arise from the consideration of forms of actual objects, just as numerical concepts arise from the consideration of collections of objects. E.g. the idea of a cube results from observing that the corresponding physical object, as a die occupies a certain part of space. This implies the first geometric assumption, viz. that space is divisible. In this case it is divided into two parts, that within the cube and that outside of it. Geometry considers only the former, the space occupied by a substance. This space is

called a geometric solid or simply a solid. The boundary between the space and that outside of it is a surface. A surface, being itself an element of space, is also divisible, and the boundary between two parts of it is called a line. A line, in turn, is divisible by a point. The number, comparative size, and position of these elements unite to make the concept cube. With accurate ideas of point, line, surface, solid, it is easy to imagine a world of geometric figures formed by their combinations. It is then only necessary to add concise definitions and axioms (q.v.) to found a system of geometry. But the validity of these assumed premises must determine the validity and scope of the resulting science—a fact forcibly exemplified in the case of Euclidean geometry.

Geometry was developed by the ancients, especially by the Greeks, to a high degree. But their constructions and solutions in elementary geometry were generally effected by the use only of the straight edge and compasses (instruments corresponding to the geometric elements, straight line and circle). Their achievements were, therefore, limited, and such problems as the trisection of an angle, the duplication of a cube, and all those which cannot be expressed by equations of the first or second degree, remained unsolved until the introduction of other instruments. The word 'geometry' signifies land-measure, and Herodotus attributes the origin of this science to the necessity of resurveying the Egyptian fields following each inundation of the Nile. He refers to the plan of taxation enforced by Sesostris (Rameses II.), which required a survey of the land. Proclus also confirms the Egyptian origin of geometry by saying that Thales introduced this art from that country into Greece. The greatest among the disciples of Thales was Pythagoras, who formulated deductive geometry, and discovered many important propositions. Among the illustrious successors of Pythagoras were Anaxagoras, Anaximander, Bryson, Antiphon, Hippocrates of Chios (who duplicated the cube, but not by elementary geometry), Zenodorus, Democritus, and Theodorus. To this list should be added the name of Plato, who introduced a new epoch in the science by formulating the method of geometric analysis, and emphasizing the necessity of accurate definition. Menæchmus, a contemporary of Plato, discovered the conic sections. Among those who studied at the Academy of Plato were Eudoxus, the inventor of proportion, exhaustions, and many theorems found in Euclid's *Elements*, and Aristotle, who improved many geometric definitions. The name of Euclid marks another epoch in the history of geometry. Euclid's work is remarkable not for its originality, but for its simplicity and perfection as a logical system, based as it was on the discoveries of his predecessors. This work of fifteen books, called the *Elements*, has for over two thousand years formed the basis of elementary instruction in geometry wherever the science has been taught. For the development of the geometry of conic sections we are indebted to Apollonius of Perga, and to Archimedes. The later Greeks also cultivated geometry enthusiastically, as is attested by Nicomedes and Hipparchus, and in the Christian Era by Ptolemy and Pappus.

The elementary plane geometry ordinarily studied in our schools is based directly, or indirectly through the work of Legendre, upon

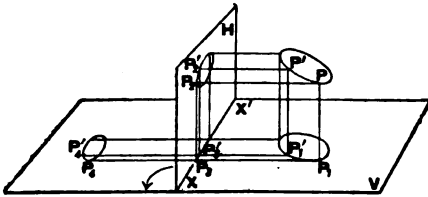
Euclid's *Elements*. Of this classic work, the first four and the sixth 'books' are devoted to plane geometry, that is, geometry in which the figures can all be imagined in one plane, even though, for purposes of superposition, they may be imagined as taken out of that plane in the course of the discussion. Euclid's treatment of solid geometry, in which the figures are imagined as occupying three dimensions, was so meagre that the elementary treatment of the subject to-day differs quite radically from that in the *Elements*. One of the principles of Euclid's work now most often violated is the attempt to avoid hypothetical constructions. For Euclid seeks to show how to construct each of the figures needed before he makes use of it. Thus, since it is impossible to trisect a general angle by the use of the compasses and the unmarked straight edge, Euclid would have been estopped from asking such a question as, Do the arms of an angle, and the two lines which trisect the angle, trisect a transversal of these lines? At present it is more common to assume that the necessary figures can be constructed, and see what propositions can be proved from certain assumed postulates and axioms. Later, the question of the figures admitting of construction by the compasses and straight edge is considered by itself. Euclid's work is still used as a text-book in the schools of England and her colonies; but it has long since given way to a more modern treatment in most other countries.

The basis of ancient geometry as set forth in the *Elements* went practically unchallenged until the nineteenth century. The renewed interest in the science, growing out of the Renaissance, inspired the investigation of Euclid's assumptions, and led mathematicians to seek to demonstrate the fifth postulate or twelfth axiom (given by Brill as the eleventh), viz. that two unlimited straight lines intersect on that side of a transversal on which the sum of the interior angles is less than a straight angle. Among the eminent mathematicians who sought to show the dependence of this proposition upon those preceding it were Legendre and Gauss. Lobatchevsky and Bolyai were the first to construct a geometry independent of Euclid's assumption, and thus to found the so-called non-Euclidean geometry. Then at once followed a great advance toward exploring the new field, and from the researches of Riemann, Helmholtz, and Beltrami, it is concluded that ten of the Euclidean assumptions are valid for all geometry, but that the one just mentioned and "two straight lines (or, more generally, two geodesic lines) include no space," are limited to the properties of particular space. Riemann and Helmholtz formulated assumptions for a geometry in space of n -ply manifoldness and with constant curvature, and observed that on the sphere, whose curvature is constant and positive, the sum of the angles of a triangle is less than a straight angle, this characterizing the space of the geometry of Bolyai and Lobatchevsky. Klein has designated these three geometries respectively, the elliptic, parabolic, and hyperbolic. Starting with this broader view, many of the leading mathematicians of the last quarter of a century, including Cayley, Lie, Klein, Pasch, Killing, Fiedler, and Mansion, have given much attention and made valuable contributions to the subject of geometry.

Without questioning the validity of Euclidean

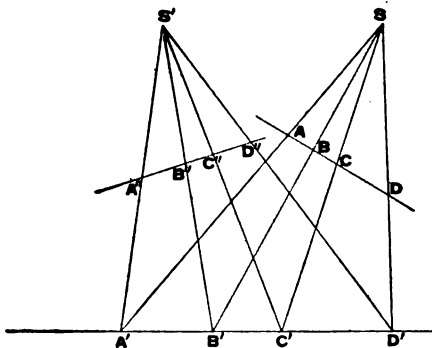
geometry, there have grown out of it in modern times two great systems—an analytic, or coördinate (see ANALYTIC GEOMETRY), and a synthetic, or 'modern' geometry. The latter embraces descriptive and projective geometry, although systems of coördinates have been introduced also in the latter.

DESCRIPTIVE GEOMETRY. This has for its object the representation of solids upon two planes at right angles to each other, these planes then being, for convenience, flattened out into a single plane. This may be done in a variety of ways, but the original method is that of parallel rays perpendicular to the planes, and known as the orthographic or orthogonal projection. These projections are commonly made, one on a horizontal plane (called the plane of the figure), and one on a vertical plane (called the elevation); e.g. take



a circle as the given figure, and let HV be the planes of projection intersecting in XX' . Draw PP_1 , $P'P_1$, perpendicular to H , PP_2 , $P'P_2$, perpendicular to V . The rays from P determine the plane perpendicular to XX' at P' , and those from P' determine a plane \perp to XX' at P'_2 . Continuing in this way, the circle is projected into an ellipse on H , and into an ellipse on V . The plane V may now be revolved about XX' through 90° , causing the projection P_2, P'_2 to form P_2, P'_2 , and thus representing two projections of the circle in the same plane. This process is entirely reversible, from which it is clear that a figure may be constructed from its projections. Descriptive geometry is a powerful agent in solving the problems of mechanics and the constructive arts; e.g. in the planning of machinery, arches, and conduits.

PROJECTIVE GEOMETRY. As the name suggests, this investigates the properties of figures by means of projections. The fundamental idea is that of



transforming a plane figure into a plane figure by means of projective pencils, or three-dimensional figures into three-dimensional figures by means of a sheaf of rays. In the broader sense, projective geometry also includes the study of the corresponding forms of various dimensions; e.g.

the axial pencil (planes with a common axis) corresponds to the pencil of rays (lines with a common point). If two ranges of points, as A, B, C, \dots and A', B', C', \dots , or as A, B, C, \dots and A'', B'', C'', \dots in the accompanying figure, are such that the lines which join corresponding points concur, as at S , the two ranges are said to be in perspective; but A, B, C and A'', B'', C'' are said to be projective. The anharmonic ratio (see ANHARMONIC RATIO) of projective ranges is constant, i.e. $(A'' B'' C'' D'') = (ABCD)$. This property forms the basis of the general definition of projective plane figures, which may be stated thus: Any two plane figures in which for every point of the one there is a point in the other, and for every line in the one there is a line in the other, and so related that the anharmonic ratio of any corresponding ranges of four points or corresponding pencils of four lines are equal, are said to be projective.

HYPER-GEOMETRY. Generalization has led geometers to imagine other spaces than that in which we live, and to seek the properties of figures existing in space of more than three dimensions. The result has been the building up of a geometry of hyper-space or of n dimensions. Reasoning in this geometry is possible only by the use of symbols. Since a line segment, i.e. a figure of one dimension, is represented by an algebraic quantity of degree 1, such as a ; since a square having two dimensions is represented by the algebraic expression a^2 ; and, finally, since a cube, having three dimensions, is represented by the algebraic expression a^3 —the idea naturally suggests itself that some figure of four dimensions corresponds to the symbol a^4 , and that, in general, some figure of n dimensions corresponds to the symbol a^n . The fact that four dimensions cannot be represented in the three-dimensional space in which we live has little bearing upon the idea itself; a three-dimensional figure (a solid) cannot completely be represented on a plane, and yet mathematical thought involving the concept of three-dimensional space would remain logical and useful even if all actual figures were only two-dimensional.

The idea of the fourth dimension thrusts itself upon the mind even more prominently in studying rectangular coördinates in analytic geometry; $ax = b$ represents a point, one axis being necessary; $ax + by = c$ represents a line, two axes being necessary; and $ax + by + cz = d$ represents a plane, three axes being necessary. This suggests that $ax + by + cz + dw = e$ may represent a three-dimensional figure in a four-dimensional space. It is evident that just as we can draw in a plane the nets of the five regular bodies, we ought to be able, by analogy, to model in three-dimensional space the solid nets of all the six structures of four-dimensional space corresponding to the five regular bodies. This has been done by Schlegel, the models being made by Brill of Darmstadt. The figure corresponding to the square and cube may be described as follows: It is bounded by 8 cubes, just as the cube is bounded by 6 squares; it has 16 corners, 24 squares, and 32 edges, so that from every corner 4 edges, 6 squares, and 4 cubes proceed, and from every edge 3 squares and 3 cubes. Thus, reasoning by analogies, mathematicians have gradually developed higher geometric systems, and have succeeded in greatly extending the scope of geometry. The idea of higher dimensions has been brought

somewhat into disrepute owing to the efforts of the followers of Professor Zöllner, of Leipzig, to explain the phenomena of spiritualism by making the fourth-dimensional world the abode of spirits. Nevertheless, mathematicians agree as to the great practical value of the idea, inasmuch as it leads to important simplifications of mathematical language, and especially inasmuch as by its perfect generality it gives remarkable clearness to the concepts of real geometry. A reasonable mathematical treatment of the subject may be found in Schubert's essay on the "Fourth Dimension," in his *Mathematical Essays and Recreations* (Chicago, 1898).

The phases of modern geometry are closely interwoven in their historic as well as in their logical development. Monge, the father of modern geometry, published his *Géométrie descriptive* in 1800, five years after the work of his pupil, Lacroix, appeared. Following his works were those of Hachette (1812, 1818, 1821), and later Leroy (1842), Olivier (1845), de la Gournerie (1860). In Germany leading contributors have been Ziegler (1843), Anger (1858), Fiedler (3d ed. 1883-88), and Wiener (1884-87). Monge did not confine his labors to descriptive geometry; he set forth the fundamental theorem of reciprocal polars, though not in modern language, gave some treatment of ruled surfaces, and extended the theory of polars to quadrics. Monge and his school concerned themselves especially with the theory of form, but Desargues, Pascal, and Carnot treated chiefly the metrical relations of figures. Carnot investigated those relations in particular connected with the theory of transversals; in his works, *Géométrie de position* (1803), *Théorie des transversales* (1806). The present geometry of position (*Geometrie der Lage*) has little in common with Carnot's *Géométrie de position*.

Although Newton had discovered that all curves of the third order can be derived by central projection from five fundamental types, the origin of projective geometry is generally attributed to Poncelet (1822). He first made prominent the power of the projective relations, and the principle of continuity in research. Möbius followed Poncelet, making much use of anharmonic ratios in his *Barycentrischer Calcul* (1827). The anharmonic point and line properties of conics have been further elaborated by Brianchon, Chasles, Steiner, and Von Staudt. Plücker applied the theory of transversals to curves, and Salmon discovered the so-called circular points at infinity. Brianchon (1806) extended the application of Desargues's theory of polars. To Gergonne (1825-26) is due the principle of duality, the most important after that of continuity in modern geometry. Gergonne was the first to use the word 'class,' and explicitly defined class and degree (order), showing their dual relation. He and Chasles were the first to study scientifically surfaces of higher order. Steiner (1832) gave the first complete discussion of the projective relations between ranges and pencils, and laid the foundation for modern pure geometry. In 1848 Steiner showed that the theory of polars can serve as a foundation for the study of plane curves, independent of the use of coordinates. He introduced the noteworthy curves which now bear the names of himself, Hesse, and Cayley. Chasles, in his *Aperçu historique* (1837), popularized the new geometry

and introduced the name homographic, and extended the homographic theory. Von Staudt (1847, 1856-60) set forth a complete pure geometric system in which metric geometry finds no place. Cremona (1862, 1875), Townsend (1863), and Clifford did much to extend the knowledge of modern geometry.

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GEOPH'AGY (from Gk. γῆ, gē, earth + φαγεῖν, phagein, to eat), or EARTH-EATING. The habit of eating clay or other earthy substances is widespread, having been noticed among the Indians of Bolivia and Peru, the Javanese, Persians, Hindus, Europeans, Africans, and certain inhabitants along the southern Appalachians in the United States. This habit is susceptible of a number of explanations. The Hopi Indians of Arizona, for instance, prepare the small tubers of the wild potato (*Solanum Jamesii*) for eating by mixing them with clay, the object being to reduce the acidity of the root. The Dyaks take along with them in their canoes a supply of red ochre and oleaginous clay to eke out their rations, just as the Veddahs of Ceylon in time of famine eat decayed wood mixed with honey, in these cases the bulk of the food appeasing hunger by giving a sensation of fullness to the stomach.

Other earth-eaters allege that clay improves the complexion; it undoubtedly imparts the ghastly sallowness declaring a clay-eater. Deniker explains geophagy as perhaps due to the necessity of supplying the need of mineral substances which induces the eating of salt. It is probable that in the majority of cases the habit is due to morbid or nervous conditions, such as cause biting of the finger-nails, chewing slate pencils, etc. The habit of geophagy is fatal, causing death by dysentery or dropsy.

GEOPHILOUS (jē-ōf'ī-lūs) **PLANT.** See GEOPHYTE.

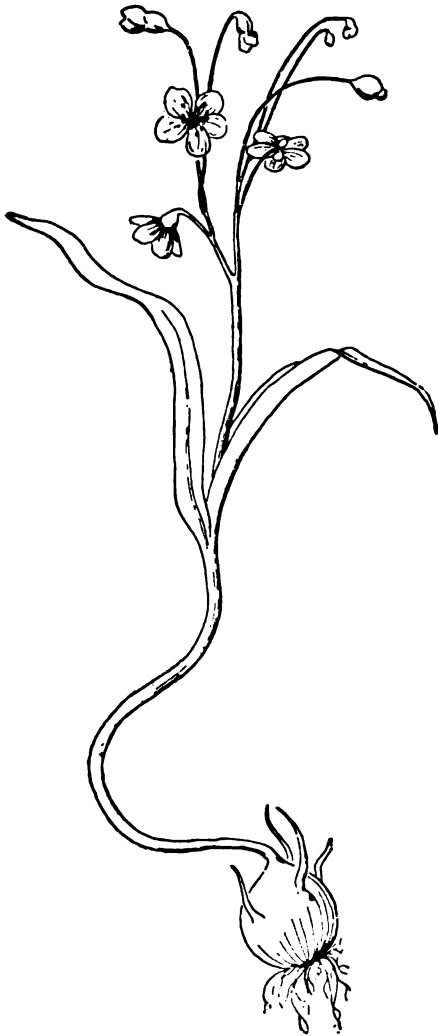
GE'OPHYTE (from Gk. γῆ, gē, earth + φυτόν, phytōn, plant). A plant whose perennial organs live under or close to the ground. The term geophilous has also been applied to such plants. The majority of geophytes have two distinct life aspects, corresponding to the periods of greater and lesser physiological activity. In the so-called growth period (summer in the higher latitudes, the rainy season in arid low latitudes), geophytes are conspicuous landscape features, by reason of

aërial organs of various kinds, such as aërial stems, leaves, flowers; in the so-called resting period, however (winter in the higher latitudes, the dry season in arid low latitudes), they are in-

clover; in these and in similar plants the perennating organs are close to the soil rather than beneath it. Biennials, such as mullein and evening primrose, have rosettes closely appressed to the soil in the winter or dry period, while in the growing period erect stems are sent up into the air. In most geophytes reserve foods are stored in the underground parts, and in many cases these parts are greatly enlarged; ordinary bulbs, roots like turnips and beets, and potato tubers illustrate this habit. The chief advantage of the geophytic habit in high latitudes is doubtless the attainment of protection from excessive cold and injuries consequent thereon; in arid regions, protection from excessive transpiration is secured by a sojourn in the soil.

GE'OPONTIKA (Gk. γεωπονικά, nom. pl. of γεωπονικός, *geōponikos*, relating to agriculture). A Greek treatise on agriculture. It was given its present form in the tenth century by an unknown hand at the request of the Emperor Constantine VII. (Porphyrogenitus), to whom it is dedicated. The basis of this work was a compilation made in the sixth or early seventh century by a certain Scholiasticus Cassianus Bassus, from the earlier works of Vindarius Anatolius of Berytus, and Didymus, of the fourth or fifth century. The names of some of the earlier authors to whom reference is made are Africanus, Apuleius, Damogeron, Democritus, Diophanes, Florentinus, Leontinus, Pamphilus, Paxamus, the Quintilii, Varro, and Zoroastres. The twenty parts into which the treatise is divided contain a mass of rules and directions bearing on the daily life of the husbandman. The best edition is that of Beckh (Leipzig, 1895). Consult Krumbacher, *Byzantinische Literaturgeschichte* (Munich, 1897), pp. 261ff., and the works there referred to.

GEORGE I. (GEORGE LOUIS) (1660-1727). The first Hanoverian King of Great Britain and Ireland (1714-27). He was the son of Ernest Augustus, first Elector of Hanover, and Sophia, granddaughter of James I. of England, and was born at Hanover on March 28, 1660. Entering the army at the age of fifteen, he distinguished himself in many campaigns by his bravery. His morals, however, were as loose as those of his contemporaries of equal rank; intrigues and mistresses made his marriage with his cousin, Sophia Dorothea, unfortunate. When his mother, at an advanced age, was declared heiress to the throne of England by the Act of Settlement of 1701, George drew near to Marlborough and the Whigs, on whom he relied for the support of his claim. After the death of Queen Anne, accordingly, he succeeded to the crown without difficulty, and reached England August 18, 1714. Unlike William III., who had aimed to reconcile opponents by calling men of both parties to the Ministry, George, a far inferior man, employed Whigs only as advisers. Utterly ignorant of English character, and even of the language, and lacking sympathy with his new subjects, he aimed to exploit England for the benefit of his German electorate. Another ground for his unpopularity was the greed of his favorites and mistresses, who sold offices, great and small. George had little to do personally with the Government, which was carried on by his ministers, at first by Stanhope and Townshend, and later by Walpole. The Jacobite insurrection of 1715 was easily suppressed, the leaders were put to death, and about



GEOPHYTE.

A spring beauty (*Claytonia*), showing the underground corm; the other (aërial) portions are present only a small part of the year.

conspicuous by reason of the relative absence of aërial organs. The most extreme geophytes are those whose organs are entirely beneath the soil during periods of lesser activity; examples of this class are bulbous plants (such as onions and lilies), plants with corms (such as Indian turnip and spring beauty), and rootstock plants (such as sweet-flag and bracken-fern). In the cases cited, the entire plant is often hidden from ordinary view during the resting season. One may also include in this category plants (like the carrot and dock) whose stems die down to the root at the close of a season of active growth; such plants usually have prominent roots. The geophytic habit is also shown, though to a less extreme degree, by ordinary lawn grasses and by

a thousand rebels were transported to the plantations. After this event George's frequent visits to Hanover made him still more unpopular, and even while he was in England he rarely attended the Cabinet, as he could not understand the discussions. For these reasons the power came rapidly into the hands of Walpole. In one of the absences (1720), the South Sea bubble burst, and the misfortune was naturally laid at the King's door; the company was alleged to have paid great bribes to the Duchess of Kendall, his favorite mistress. Thereupon some advised George to abdicate in favor of the Prince of Wales; others urged him to seize absolute control of the Government. Without permitting him to resort to either expedient, Walpole, supported by Townshend, brought the Government safely through the crisis. Some time afterwards the demand of Spain for the restoration of Gibraltar and of Minorca (1725) led to a short war with that country. Admiral Hosier commanded an unsuccessful expedition to the Spanish possessions in America (1726), but in 1727 peace was signed. The King died of apoplexy on a journey to Hanover on June 11, 1727. He had two legitimate children—George, who succeeded him, and Sophia Dorothea. Commonplace in ability as well as in personal appearance, George nevertheless gave England a wise foreign policy, and though he was by nature autocratic, the circumstances of his reign favored the growth of constitutional principles.

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GEORGE II. (1683-1760). King of Great Britain and Ireland, Elector of Hanover, 1727-60. The son of the preceding, he was born at Herrenhausen, Hanover, November 10 (new style) 1683. After his mother's divorce in 1694, he lived with his grandparents, who superintended his education. On September 2, 1705, he married the Margrave of Anspach's daughter, Carolina Wilhelmina. His code of morals was on a par with his father's, but his wife gained considerable influence over him by condoning his infidelities; and her death, in 1737, which was considered a national loss, he genuinely deplored. In 1708 he joined Marlborough's army, and showed conspicuous bravery at Oudenarde, where he narrowly escaped death. At his father's accession to the throne he was created Prince of Wales. Owing to his affection for his mother, he had never been on good terms with his father, who connived at a plot for his forcible disappearance. Their mutual repugnance increased when the King, during his visits to Hanover, was averse to appointing the Prince guardian of the realm. The Prince supported the opposition party, but at his father's death in 1727 was persuaded by the Queen to retain Walpole in power. Walpole's Administra-

tion was distinguished by the preservation of peace, and his unwillingness to declare war with Spain led to his resignation in 1742. He was succeeded by Carteret, who favored a war policy. Anxious for the safety of Hanover, the King made an alliance with Maria Theresa of Austria in the Silesian Wars, and at Dettingen, in 1743, commanded the victorious army in person. The Young Pretender's rebellion in 1745-46 was suppressed at Culloden by the Duke of Cumberland, the King's second son. England joined Prussia in the Seven Years' War, which brought about the downfall of the colonial power of France. In 1757, by the victory of Plassey, Clive laid the foundations of the Indian Empire, and in 1759 Wolfe's victory on the heights above Quebec achieved the conquest of Canada. In 1749 the funds rose above par, and Pelham effected an appreciable reduction of the national debt by reducing the interest from 4 to 3 per cent. George II., although a mediocrity, and possessed of an obstinate temper, was always sagacious enough to perceive the superior wisdom and prudence in the counsels offered by his ministers, and acceded to their advice, to the material benefit and industrial progress of the country. At the end of his reign Pitt conducted the affairs of the nation. George II. died suddenly from rupture of the heart, October 25, 1760, at Kensington. Consult: Hervey, *Memoirs of the Reign of George II.* (London, 1854); Walpole, *Memoirs of the Last Ten Years of the Reign of George II.* (London, 1822, 1846); Schmucker, *History of the Four Georges* (New York, 1860); Thackeray, *Four Georges* (London, 1861); McCarthy, *History of the Four Georges and William IV.* (London, 1884-1901); Jesse, *Memoirs of the Court of England from the Revolution of 1688 to the Death of George II.* (London, 1843); Coxe, *Memoirs of the Life and Administration of Sir Robert Walpole* (London, 1798); id., *Memoirs of Horatio, Lord Walpole* (London, 1802).

GEORGE III. (1738-1820). King of Great Britain and Ireland, 1760-1820. He was born on June 4, 1738, and succeeded his grandfather, George II. His father was Frederick Louis, Prince of Wales, and his mother was Augusta, daughter of the Duke of Saxe-Gotha. His early education was the occasion of much quarreling between his father and grandfather, and suffered in consequence. His governor and preceptors were often changed, in accordance with their supposed political influence on his character. He grew up with a limited education; he spoke French and German, but knew little Latin and less Greek. His English was poor in conversation, and worse in writing. He spelled badly, and had no taste for literature. Nevertheless, he began the famous collection of books and manuscripts which, under the name of King's Library, is one of the greatest treasures of the British Museum, and he had a genuine appreciation of music.

George III. had but average ability, but more than average obstinacy. Although a great stickler for formalities and royal dignity, he was simple and economical in his tastes, which were emphatically those of the middle class. He had a taste for farming, and was fond of petty mechanical contrivances, and was often derisively called 'Farmer George' and 'the royal button-maker.' He was sincerely pious, and, unlike his

immediate predecessors and successors, was highly moral. He married in 1701 the Princess Charlotte Sophia, daughter of the Duke of Mecklenburg, and became the father of fifteen children. He was a man of great courage, and in moments of danger preserved the greatest dignity. At the time of the Lord George Gordon riots his was the only clear head in the Council, and it was due to his advice that the riots were suppressed.

George III. was perhaps the most important figure in the British constitutional development of the eighteenth century. In his boyhood his mother had instilled exalted notions of the royal prerogative into his mind. The Earl of Bute, his chief instructor later, by his influence emphasized these tendencies. His plan was to do away with the party system as it then existed, and to resume the powers of the Crown which had been appropriated by the Cabinet Ministry. From the time of the accession of the House of Hanover the Whig oligarchy had controlled Parliament, and by their chosen Ministers ruled the King. George III. designed to break up this oligarchy, and to make himself the ruler. He differed from the Stuarts in that he proposed to rule constitutionally, with the consent of Parliament; and from the Pitts in that he wished to overthrow the oligarchy by exercise of the royal power, instead of appealing to public sentiment. He re-assumed the Crown patronage which had passed into the hands of the Cabinet, and by it organized a group of politicians upon whom he could depend. The 'King's friends' thus became an important factor in politics. He did not hesitate to use corruption to gain his ends, both in general elections and in securing Parliamentary votes, according to the custom of his age. Although at times the nation disapproved of his policy, yet in the main it supported his measures, and the Whig oligarchy was finally broken.

The history of the reign of George III. is a description of the struggle he made to put his political theories into practice. After the fall of Pitt, under whom England had entered upon a brilliant career of victory and conquest in the Seven Years' War, he succeeded in 1761 in introducing some of his own friends into the Whig Ministry of Newcastle, and on the retirement of the latter in the following year he made Bute, his favorite, Prime Minister. But there was great prejudice against Bute, on account of his Scotch nationality and well-known opinions on the royal prerogative. He was not a man of sufficient ability to overcome this prejudice, and, recognizing his failure, resigned in 1763. Meanwhile the Whig Party had broken up into three factions, and the King invited George Grenville, the leader of those whose opinions differed least from his own, to form a new Cabinet. He approved of the prosecution and exile of the Radical leader Wilkes by Grenville, and the Stamp Act (1765) taxing the American colonies. But being unable to tolerate Grenville's rudeness and dictatorial attitude, he dismissed him, and reluctantly admitted the Rockingham Ministry, which represented the most liberal of the Whig factions, and the only English party that made no use of Parliamentary corruption. Their liberal measures, notably the repeal of the Stamp Act, displeased the King, and in 1766 he invited Pitt, whom he made Earl of Chatham, to form a Cabinet. Pitt's Cabinet was formed, but the King's plans

were frustrated by the failure of the Prime Minister's health. During the Ministry of Grafton that followed, the King approved of Townshend's import duties levied on America in 1767, and also of the exclusion of Wilkes from the House of Commons, although the attitude of the House was in opposition to the best political and legal thought of the day. On the resignation of Grafton he at last found in Lord North a Minister after his own heart. North honestly agreed with the King's ideas, and tried to carry them out. He was firm and able, seldom gave offense, and had great tact for managing Parliamentary majorities. During his long Ministry (1770-82) the King virtually directed political affairs, as his correspondence with Lord North shows (ed. by W. B. Doane, London, 1867). Throughout the American War, of which he was strongly in favor, his wishes controlled the Ministry, the Commons being a mere instrument in his hands. After the French-American alliance he alone wished to continue the war, refusing to allow Lord North to resign. When at last the inevitable resignation came, he contrived to break up the second Rockingham Ministry, through the influence of Shelburne. On the downfall of the Shelburne Ministry he defeated by his personal efforts the combination Ministry of Fox and North. In the face of a hostile majority he appointed the younger Pitt as Prime Minister, and the electors signified their approval by returning a Tory majority to Parliament.

Although Pitt was by no means subservient, there was no friction between him and the King, who approved most of his measures. George was strongly in favor of the long and ruinous war with France, and of the union which Pitt forced upon Ireland in 1801. He was opposed, however, to Pitt's attempted Parliamentary reform in 1785, and to the impeachment of Warren Hastings, which measures were after all defeated. He refused to allow the Cabinet to appoint the bishops, as had become the custom, and in the case of Archbishop Sutton of Canterbury took the appointment directly out of Pitt's hands. He refused positively to grant Catholic emancipation, which he conceived to be contrary to his coronation oath, and in 1801 forced Pitt to resign rather than allow his promise of emancipation to the Irish Catholics to be fulfilled. In 1804 he dismissed the entire Addington Ministry because its members refused to pledge themselves never during his life to advocate Catholic emancipation. His dislike of Fox, who he supposed had a bad influence on the Prince of Wales, is well known. He repeatedly refused to allow him to enter the Ministry (1781, 1782, 1803, 1804, 1806), "even at the hazard of a civil war." This dislike he lived to overcome, and he much regretted the death of Fox.

The King's last years were darkened by many troubles, keenest of which was the conduct of his brothers and of his children, particularly the Prince of Wales, whose immoral and undutiful behavior embittered his life. He had to bear the brunt of popular ill feeling occasioned by the economic misery the French War brought to England. He was also afflicted by sickness. In 1805 he had trouble with his eyes, and by 1809 he became blind. As early as 1765 he was mentally deranged for a short time. In 1788 there was a recurrence of the same trouble, and the

first Regency Bill was passed, but he speedily recovered. In 1811 he finally became hopelessly insane, and his son (afterwards George IV.) acted as Regent until the King's death, on January 29, 1820.

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GEORGE IV. (GEORGE AUGUSTUS FREDERICK) (1762-1830). King of Great Britain and Ireland, 1820-30. The eldest son of George III., he was born in Saint James's Palace, August 12, 1762, and was created Prince of Wales five days afterwards. He received a careful and complete education, with strict discipline, but displayed an ungovernable temper, and on attaining his majority became notorious for his profligacy and extravagance. He contracted a marriage with Mrs. Fitzherbert, December 21, 1785; but in 1787, to obtain Parliamentary assistance for his debts, he allowed Fox to deny the marriage in Parliament. On April 8, 1795, again to liquidate his debts, he married his cousin, Caroline Amelia Elizabeth of Brunswick (q.v.). They had one daughter, the Princess Charlotte Augusta, born January 7, 1790, who married Prince Leopold, afterwards King of Belgium, but died in childbed, November 6, 1817. George deliberately deserted his wife shortly after his daughter's birth, and his conduct toward her, his attempts to procure a divorce, his numerous mistresses, and general behavior, made him extremely unpopular, notwithstanding his cleverness, versatility, and gracious manner, which among a certain class of associates earned him the title of 'the first gentleman in Europe.' From a spirit of antagonism he supported the Whig opposition, and his father's insanity was partly due to his misconduct. He became Prince Regent in 1811, and King at his father's death, on January 29, 1820. The Napoleonic wars; the War of 1812-15 with the United States; the aid rendered to the Greeks by the British fleet in the battle of Navarino (1827), which secured the independence of Greece; and the passing of the Roman Catholic

Emancipation Bill (1829), are the notable events of his reign. He died at Windsor, June 26, 1830. Consult: McCarthy, *History of the Four Georges and of William IV.* (4 vols., London, 1884-1901); Thackeray, *Four Georges* (London, 1861); Lady Bury, *Diary of the Times of George IV.* (London, 1838); Croly, *Life of George IV.* (London, 1830); Huish, *Memoirs of George IV.* (London, 1830); Langdale, *Memoirs of Mrs. Fitzgerald* (London, 1856); Holland, *Memoirs of the Whig Party* (London, 1854); Fitzgerald, *Life of George IV.* (London, 1881).

GEORGE I. (1645—). King of Greece since 1863. He is the second son of King Christian IX. of Denmark, and served for some time in the Danish Navy. After the deposition of King Otto in 1862, the National Parliament in the following year conferred the crown on Prince William of Denmark, as George was then called, who, with the concurrence of his own family and the consent of the great Powers, ascended the throne of Greece as George I. He was married at Saint Petersburg to Princess Olga, daughter of Grand Duke Constantine, October 27, 1867. The King has consistently pursued a Pan-Hellenic attitude, as shown especially in the war with Turkey (1897). See GREECE.

GEORGE V. (1819-78). The last King of Hanover. He was the son of Ernest Augustus (q.v.), and when he ascended the throne in 1851, on the death of his father, he was afflicted with blindness. He entertained exaggerated ideas of the sacredness of the royal power, and lent himself to the plans of the reactionary party. He was a bitter foe to Prussia, and joined Austria against her in 1866. After Austria's defeat Hanover became a part of Prussia, and King George went to Vienna and then to Paris, where he continued to agitate against Prussia. In 1868 he relinquished his claims to Hanover for the sum of 16,000,000 thalers; but his enmity to Prussia declared itself so strongly that the sum was not paid, but was held by the Government as the 'Guelph Fund' (q.v.). The Duke of Cumberland, son of George V., having disclaimed in 1892 all intentions of pursuing an anti-Prussian attitude, the revenues of the fund have since been paid to him.

GEORGE II. (1826—). Duke of Saxe-Meiningen and Hildburghausen, born at Meiningen, a son of Duke Bernhard II. He was educated at Bonn and Leipzig, and succeeded upon the resignation of his father in 1866. He is known as a patron of the drama, and advanced histrionic art by organizing, with the assistance of his intendant and manager, Ludwig Chronnegk, a troupe of actors who played in Europe and America.

GEORGE, Prince of Denmark (1653-1708). Husband of Queen Anne of England. He was the son of Frederick III. of Denmark. By Anne, whom he married in 1683, he had seventeen children, all of whom died before their mother became Queen of England. Prince George was devoid of talent and ambition, but was brave and humane. Through his wife's influence he deserted James II. in the hour of need. After the triumph of the Prince of Orange, Prince George was naturalized and created Duke of Cumberland. He was present at the battle of the Boyne, and when his wife ascended the throne he was created Lord High Admiral, an office in which he acquit-

ted himself quite badly. He had very little influence in English politics, though Anne was very fond of him.

GEORGE, called **THE BEARDED** (1471-1539). Duke of Saxony. He was the eldest son of Albert the Brave, founder of the Albertine line of dukes. He received a theological education at Meissen and Leipzig, and succeeded his father in 1500. He was a good ruler, kindly and accessible to his subjects. Though he agreed with Luther as to the need of reform in the Church, the Duke did not acquiesce in the change in dogma advanced by him, and he soon became an ardent opponent of the Reformation, especially after the famous debate between Luther and Eck at Leipzig in 1519. He persecuted the Lutheran clergy who had broken their vows of celibacy, and died in great grief at the thought of being succeeded by a fervent Protestant, his brother Henry.

GEORGE, called **PISIDA**, 'the Pisidian.' A prominent churchman and writer of Constantinople in the latter half of the seventh century. He held various offices in the 'Great Church' (of Saint Sophia), and is thought to have accompanied the Emperor Heraclius on his expedition against the Persians (A.D. 622). He was the author of many poems of a historical or religious character, in which he celebrated the wars of Heraclius, and discussed the theological questions of the day. His verse is correct and elegant, and he was greatly admired by the Byzantine writers.

GEORGE, FREDERICK WILLIAM ERNEST (1826-1902). Prince of Prussia, general and author. He entered the Prussian Army in 1836, was advanced to the rank of lieutenant-general in 1860, and subsequently became general of cavalry (1866). His dramatic works, published under the name of G. Conrad, are very numerous, and several of them have been publicly performed, and are still sometimes played. They include: *Wo liegt das Glück?* (1877); *Don Sylvio* (1877); *Elektra* (1877); *Yolanthe* (1877); *Medea* (1877); *Sappho* (1887). Although not strikingly original, these plays are skillfully constructed. Prince George also studied music, and in his youth was a pianist of some skill.

GEORGE, HENRY (1839-97). An American economist, born in Philadelphia, Pa. When fourteen years old he was forced to leave school, and to seek work in order to support himself. After shipping as foremast boy on a vessel bound for Melbourne and Calcutta, he learned the printer's trade, and in 1858 worked his way to California. At this time the excitement attending the discovery of gold in Fraser River, B. C., was at its height; and Henry George worked his way to Victoria on a sailing vessel. After enduring many privations he returned to San Francisco, where he found work in a printing office. As the business of the printing office grew slack, he secured a position in a rice-mill. For the next few years he drifted from one employment to another, always in financial straits, due to no lack of energy on his own part. In 1861, in company with five other printers, he undertook to publish a daily newspaper, the *Evening Journal*, but this venture also proved unsuccessful. In 1865 he began to write for the press; and it is noteworthy that one of his earliest productions urges workmen to think about political and social condi-

tions, to find if it be possible to "check the tendency of society to resolve itself into classes that have too much or too little." At this time he was engaged as a reporter on the *San Francisco Times*, where he was quickly promoted to the position of chief of staff. In 1866 he wrote a letter to the *New York Tribune* attacking the Central Pacific Railroad and the Wells, Fargo Express on the ground of their monopolistic extortions. In 1869 he wrote for the same paper a letter on the Chinese question, which gained the warm commendation of John Stuart Mill. The great fortunes acquired in California through the rapid increase in the value of land fixed his attention upon the land problem; and in a pamphlet published in 1871, entitled *Our Land Policy*, he advanced most of the ideas that later appear in *Progress and Poverty*—that the value of land represents in the main a monopoly power, and that the entire burden of taxation should be levied upon it, thus freeing industry from taxation, and equalizing opportunities by destroying monopoly advantage.

Progress and Poverty, George's most important work, was first published in 1879. At first it attracted little attention and found few buyers, but in a few years it attained extraordinary popularity, especially in England, where the Irish land problem was the burning question of the day. Interest in the book increased at home, and by 1883 Mr. George found himself regarded as the apostle of a new social creed. From this time his activities were engaged chiefly in lecturing both in America and in the United Kingdom, and in writing articles for papers and magazines on the land question and on other economic and political subjects. His literary activities brought him but little pecuniary return, and he remained in straitened circumstances until the end of his life. In 1886 George became a candidate for the mayoralty of New York City, but was defeated by Abram S. Hewitt. In 1897 he again ran for Mayor, but died before election day.

The chief contributions of Henry George to economic science are to be found in *Progress and Poverty*. *The Science of Political Economy*, published after his death, contains little that is of value. The main thesis of *Progress and Poverty*, that economic rent should be confiscated by means of the single tax, has not received acceptance from scientific writers. But the theory of wages which he advanced in opposition to the prevailing "Wages Fund Doctrine," that the laborer is paid, not out of capital, but out of the value which he himself creates, has been adopted by some of the most important economists of the day. For a discussion of the views of Henry George in relation to the Single Tax Theory, see **SINGLE TAX**. Consult George, *The Life of Henry George* (1900).

GEORGE, JAMES ZACHARIAH (1826-97). An American legislator, born in Monroe County, Ga. After serving in the regiment known as the Mississippi Rifles during the Mexican War, he devoted himself to the study of law. Soon after the secession convention in Mississippi, he enlisted in the Confederate Army, and eventually rose to the rank of brigadier-general. As chairman of the Executive Committee of the Democratic Party (1875-76) he became a conspicuous factor in the political agitation of that period. He was ap-

pointed Chief Justice of Mississippi in 1879, and two years later was sent to the United States Senate, where he served for three successive terms. He was distinguished alike as jurist and statesman, and during his career in the Senate displayed exceptional oratorical ability and unusual power of logical reasoning. As a jurist he participated prominently in the preparation of the present Constitution of Mississippi.

GEORGE, LAKE. A lake in eastern New York, near the border of Vermont (Map: New York, G 2). It is about 36 miles long from south to north, and from one to four miles wide, generally shallow, but in some places very deep. It is connected with Lake Champlain on the north. Lake George is one of the most beautiful of the lakes of the United States. It is a favorite resort for artists and tourists. Its waters are singularly clear; it is dotted with charming islands, and the scenery of its banks, where the mountains reach elevations of over 2000 feet, is most picturesque. Great historical interest attaches to it in events connected with the French and Indian War and the War of the Revolution. The ruins of Fort Ticonderoga are on the waterway connecting the two lakes. Lake George was discovered early in the seventeenth century by the French missionaries. It was named by the English after George III., though it is sometimes known by the Indian name Horicon. The State has appropriated 35 acres of land on its shores to be called the Fort George Battle Park. On this there is to be erected a soldiers' monument.

GEORGE, SAINT (?-303). The patron saint of England. Little is known of his life, the reports concerning him being largely legendary. Although frequently confounded (as, for example, by Gibbon) with George of Cappadocia, the Arian leader, he lived at an earlier period than the latter. He is said to have been a person of consequence, born at Lydda, or at Ramleh, Palestine, and educated in Cappadocia, who embraced Christianity, attained high rank under Diocletian, and suffered martyrdom in Nicomedia in April, 303. He was extremely popular with the English Crusaders, and was adopted as the tutelary saint of England during the reign of Edward III. He is also the patron of Russia and Portugal. Churches and religious establishments have borne his name from the earliest times. He is venerated not only by the Western and Eastern churches, but also by the Mohammedans as Ghergis or El Khouder. The red cross of Saint George on a white ground was long worn as a badge by the English soldiery, and is now displayed on the Union Jack. The well-known story of the combat between Saint George and the Dragon first appears in the Middle Ages in the *Legenda Aurea* of Jacobus de Voragine. Consult Flemming, *Saint George of England* (New York, 1901).

GEORGE-A-GREENE, THE PINNER OF WAKEFIELD. A comedy (1595) ascribed to Robert Greene on the evidence of certain obscure and contradictory manuscript notes on the title-page of a copy now in the possession of the Duke of Devonshire. At any rate, the reputed author acted the part of the Pinner. The sources are an early prose romance entitled *The History of George-a-Greene*, and a ballad called *The Jolly Pinner of Wakefield with Robin Hood, Scarlet, and John*.

GEORGE BARNWELL, OR, THE LONDON MERCHANT. A bourgeois tragedy in prose, by George Lillo, produced at Drury Lane, June 22, 1731. It concerns the temptation, fall, and death of a London apprentice. It was founded on a seventeenth-century ballad (Percy, *Reliques*, 3d series, bk. iii. No. 6). Consult Cibber's *Life of Lillo*.

GEORGE ELIOT. The pseudonym of Mary Ann Evans, the English novelist. See ELIOT, GEORGE.

GEORGE FREDERICK, Prince of Waldeck. A German soldier. See WALDECK, GEORG FRIEDRICH.

GEORGE JUNIOR REPUBLIC. A community of boys and girls near Freeville, New York, about nine miles east of Ithaca. It was founded in 1895 by Mr. William R. George, of New York, for the purpose of affording neglected, reckless, and unfortunate children an opportunity to acquire the qualities necessary for their future welfare in life, and was the outcome of an experiment which Mr. George had been conducting for some years by taking every summer from 150 to 250 children of the slums to spend their vacation with him at his country home.

The constitution of the miniature republic is modeled upon that of the United States, with elective officers, a legislature (first a town meeting and later two branches), a judicial system, and administrative machinery. At first Mr. George was president, with adults in the higher offices, but since 1896 the boys have filled all offices, Mr. George retaining a veto power. Each citizen was obliged to work or starve: he could work for Mr. George for six hours a day, or for citizen contractors, who purchased licenses for the different kinds of business from Mr. George, or in the school. Nothing could be obtained in the community except by purchase in the citizens' own tin coin (now aluminum), which at the end of the summer was redeemed in United States money, or supplies to take home. In the first year a number of practical questions were met by the youthful legislators: a depreciated currency, a tariff question, woman's suffrage, and a trust among hotel proprietors. Children from any part of the United States may be consigned to the guardianship of the trustees by parents or public authorities. The age of admission is twelve to eighteen years. The republic has a number of buildings, with simple accommodations which are used for school, government purposes, workshops, hotels, restaurants, store, bank, and library. Cottages are being built to give home life in place of that of the hotels. The kinds of work carried on under efficient directors are: farming (the trustees own or control 240 acres), carpentry (the boys put up new buildings), printing, dressmaking, scientific cooking, domestic service, care of the place, and school. All children under sixteen must attend the republic's primary and grammar school. The ambitious later go to the town high school, and a few have entered college.

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GEORGE OF CAPPADOCIA. Arian Archbishop of Alexandria, 356-361. He was a native of Epiphania, in Cilicia, yet he is always called a Cappadocian, though such only by ancestry. Our knowledge of him comes from his adversaries. They say that he began life as a parasite; then obtained a contract to furnish supplies for the army, embezzled the funds, and had to abscond to escape the indignant soldiers whom he had cheated of their rations. He seems to have lived for some time at Constantinople. It is not known when or how he obtained ecclesiastical orders, but in 356 he turns up as Bishop of Alexandria after the banishment of Athanasius. He had the support of the Arian faction and the Emperor Constans. His cruelty and oppression were such that a rebellion broke out and he had to flee for his life. He was restored by a military demonstration, but did not mend his ways. A few days after the accession of Julian the populace arose *en masse*, dragged him out of prison, where he had been placed by the magistrates for safety, paraded him with every indignity through the streets on a camel, burned his dead body, and cast the ashes into the sea. He is represented as ignorant not only of the Scriptures and theology, but even of letters. Yet it is said he owned a fine library which Julian had preserved for his own use.

GEORGE OF TREBIZOND (c.1396-1486). A scholar famous in connection with the revival of the study of Greek in Italy. He was born in the isle of Crete, but was descended from a family of Trebizond. A noble Venetian, Francesco Barbaro, invited him to Venice, where he became professor of rhetoric and philosophy. As secretary to Pope Eugenius IV. and later to Pope Nicholas V., he occupied a conspicuous position at Rome as a Greek scholar and as a translator of Greek authors into Latin. The inaccurate character of his work provoked the criticism of contemporary scholars, especially of Cardinal Bessarion. He was an ardent advocate of the Aristotelian system of philosophy, and engaged in controversy with his contemporary, the Platonic philosopher, Gemistus Plethon. Among his writings are *Rhetorica* (1470), and *Comparationes Philosophorum Platonis et Aristotelis* (1523).

GEORGES, zhôrz, MARGUERITE JOSÉPHINE WEIMAR, known as Mlle. Georges (1787-1867). A French tragic actress of great beauty and talent, born at Bayeux. When she appeared at the Théâtre Français in 1802 as Clytemnestra, she made an unusual sensation. In 1808 she suddenly deserted her position and went to Russia. She played before Napoleon at Dresden in 1812, however, and in 1813, under the patronage of Hortense, was allowed to return to the Comédie Française, but left that stage definitely in 1816. Talma was one of her teachers. She devoted herself upon the stage to the romantic movement led by Victor Hugo and Alexandre Dumas, and in their works won some of her greatest triumphs. Among her famous rôles were Dido, Semiramis, Lucrezia Borgia, and Mary Tudor. Her later years of retirement were unhappy, largely through the caprices that had marred her career, and the comparative poverty which ensued.

GEORGE SAND, *Fr. pron.* zhôrzh sänd. See SAND, GEORGE.

GEORGE'S CHANNEL. See SAINT GEORGE'S CHANNEL.

GEORGES DANDIN, zhôrzh dän'dän'. The title of a comedy by Molière (1668), perhaps built upon one of his previous farces, produced first at Versailles. Its story goes back to Boccaccio, and is of a highly satirical character.

GEORGETOWN. The capital of British Guiana, situated on the right bank of the River Demerara, one mile from its mouth (Map: Guiana, British, F 2). It is well built, and its streets are regular and well shaded by trees. The houses are generally of wood. Some of the streets are traversed by canals. Among the public buildings may be mentioned the Anglican Cathedral, the museum, with its library, the Colonial Hospital, orphan asylum, Queen's College, teacher's seminary, seamen's home, etc. There are also botanical gardens, schools, theatres, barracks, street-railways. Georgetown is connected by rail with Mahaica. Along the banks of the river extends the 'Ring,' a promenade sheltered with cabbage-palms. The city is supplied with water from artesian wells. The harbor provides good anchorage, and has a mole and fortifications. The climate is exceedingly unhealthful, owing to the swampy nature of the surrounding country. The commerce is considerable, the chief exports being sugar, coffee, and rum. The population in 1891 was 53,176, of whom only about 5000 were whites.

GEORGETOWN. A city of the British Straits Settlements. See PENANG.

GEORGETOWN. A railway junction in Ontario, Can., twenty-five miles west of Toronto (Map: Ontario, C 4). Population, in 1901, 1313.

GEORGETOWN. A seaport town of Prince Edward Island, Can., situated on a peninsula formed by the Cardigan and Brudenell rivers, 39 miles east of Charlottetown by rail (Map: Prince Edward Island, G 3). It has steamboat communication with various ports, and carries on a considerable trade in agricultural produce. A United States consular agent is resident here. Population, 1500.

GEORGETOWN. A town and the county-seat of Clear Creek County, Colo., 52 miles west of Denver, on the Colorado and Southern Railroad (Map: Colorado, E 2). It has important gold and silver mining interests, and is popular as a summer resort because of its picturesque location and healthful climate. Population, in 1890, 1927; in 1900, 1418.

GEORGETOWN. A town and the county-seat of Sussex County, Del., 40 miles south by east of Dover; on the Philadelphia, Wilmington and Baltimore Railroad (Map: Delaware, Q 6). It is in an agricultural region, and has canning interests. Population, in 1890, 1353; in 1900, 1658.

GEORGETOWN. Formerly a town in the District of Columbia, now included within the limits of Washington (q.v.).

GEORGETOWN. A city and the county-seat of Scott County, Ky., 12 miles north of Lexington; on the Cincinnati, New Orleans and Texas Pacific, the Louisville Southern, and the Frankfort and Cincinnati railroads (Map: Kentucky, G 2). It is primarily a residential place, and

is the seat of Georgetown College (Baptist), established in 1829. The city is in an agricultural and stock-raising section, and has brick-works, flouring-mills, and manufactures of hemp and bagging. "The Royal Spring," rising in the centre of the city and flowing 200,000 gallons per hour, supplies the city with water and furnishes power for an ice plant, street-railway, flour-mill, and other industrial establishments. Settled in 1776, Georgetown was first incorporated in 1790, and was chartered as a city of the fourth class in 1894. The government is administered by a mayor, chosen every four years, and a unicameral council, elected on a general ticket. Population, in 1900, 3823.

GEORGETOWN. A village and the county-seat of Brown County, Ohio, 42 miles east by south of Cincinnati; on the Cincinnati, Georgetown and Portsmouth Railroad (Map: Ohio, C 8). It is the centre of a tobacco-growing district, and has some manufactures. Limestone is quarried in the vicinity. Population, in 1890, 1473; in 1900, 1529.

GEORGETOWN. A city and the county-seat of Georgetown County, S. C., at the head of Winyah Bay, about 55 miles northeast of Charleston; on the Georgetown and Western Railroad (Map: South Carolina, E 3). It is a seaport of some importance, the market for a fertile agricultural region traversed by 1000 miles of navigable rivers that empty into the bay; has steamship communication with New York, Charleston, and Wilmington, and exports rice, cotton, turpentine, shingles, lumber, fish, etc. Georgetown, settled about 1700, and incorporated in 1805, is famous as the landing-place of Lafayette on his first visit to the United States. The government is administered under a charter of 1892, which provides for a mayor, chosen biennially, and a council elected at large. Population, in 1890, 2895; in 1900, 4138.

GEORGETOWN. A city and the county-seat of Williamson County, Tex., 30 miles north of Austin; on the San Gabriel River, and on a branch of the International and Great Northern Railroad (Map: Texas, F 4). It has cotton-gins, cottonseed-oil mills, and planing-mills, and is the seat of Southwestern University (Methodist Episcopal, South), founded in 1873. In Page Park are mineral wells, which analysis shows to be similar to the famous Karlsbad springs. Settled in 1854, Georgetown was incorporated twenty years later, and is governed under revised statutes of 1895 by a mayor and council, elected biennially on a general ticket. Population, in 1890, 2447; in 1900, 2790.

GEORGETOWN UNIVERSITY. An institution of higher education, situated at Georgetown, D. C. It was founded in 1799 by members of the Roman Catholic Church, and was in 1805 transferred to the Society of Jesus in Maryland, in whose control it remains. By a Congressional act of 1815 the university was empowered to grant academic degrees, and in 1833 the Holy See authorized it to confer degrees in the name of the Church, in philosophy and theology. The university consists of the college, the school of medicine, organized in 1851, and including a school of dentistry, and the school of law, organized in 1870. The college comprises the graduate school, organized in 1856; the under-

graduate department; and the astronomical observatory, established in 1842. A preparatory school, with a student enrollment of about 150, is also connected with the university. The scheme of instruction is, in general, conducted in accordance with the famous *Ratio Studiorum* of the Jesuits; the supervision of students is closer than in most denominational colleges of equal standing, and the standard of scholarship is very high, especially in Latin, philosophy, logic, and English. The elective system has not been introduced. Degrees are conferred in arts, philosophy, medicine, dentistry, and law.

GEORGIA (Pers. *Gurjistan*, Arm. *Vrastan*, Lat. *Iberia*, Russ. *Grusia*; influenced in popular etymology by the name of the patron saint *George*). A region in Transcaucasia, constituting, until the year 1799, an independent kingdom, and now forming the main part of the Russian governments of Tiflis and Kutais. It comprises the ancient Iberia, Colchis, and Albania. The native name of the country is *Kathli*, or *Sakarthvélo*.

Tradition traces the origin of the Georgians to Thargamos, a great-grandson of Japhet. Mtskhethos, the supposed builder of Mtskhetha, the ancient capital, near Tiflis, is a prominent figure in their legendary history. They are known to have submitted to Alexander the Great, and to have been freed from foreign rule and united in one kingdom by Pharnabazus (B.C. 324). Georgia was Christianized during the fourth century. A Sassanide dynasty was established in A.D. 265, and continued with a half-century's interregnum until 787, when the long line of Bagratian sovereigns (see BAGRATIDES) came to the throne. The latter drove out the Arab invaders who had subjected the Sassanide princes, reunited the disorganized country, and advanced its civilization and material welfare. In the eleventh century the country was temporarily brought under the yoke of the Seljuk Turks, but regained its independence under David III. (1090-1125). Until the thirteenth century, when it was conquered by the Mongols, Georgia prospered greatly, and increased in extent under a series of able sovereigns. Under Queen Tamara (1184-1212), who married a Russian prince, and thus initiated the intimate connection of Georgia with Russia, the country attained the height of its prosperity and power. Toward the end of the fourteenth century Timur subdued Georgia, but was expelled in the beginning of the next century by George VII. Alexander I., who succeeded George VII., divided the kingdom among his three sons. Each of these States was again divided, and at one time twenty-six different princes reigned in Georgia. The history of Georgia now falls into two parts: that of the Eastern States, Kartli and Kakheti; and that of the Western States, including Imeritia, Mingrelia, and Guria. This division was fatal to the independence and power of Georgia. From the sixteenth to the eighteenth century the Eastern States were oppressed, by Persia, and in 1799 George XIII. resigned in favor of Paul, Emperor of Russia. In 1802 the Emperor Alexander proclaimed the territory a Russian province. Of the three States forming Western Georgia, Guria fell into the hands of Russia in 1801, and formally surrendered itself to that empire by the treaty of 1810; Mingrelia was virtually added to Russia in 1803; Imeritia

had been acquired by Russia toward the close of the eighteenth century. See **GEORGIAN LANGUAGE**; **GEORGIANS**.

GEORGIA (named in honor of George II. of England). A South Atlantic State, and one of the original thirteen States of the American Union (Map: United States, J 4). It is bounded on the north along the parallel of latitude 35° N. by Tennessee and North Carolina, on the east by South Carolina and the Atlantic Ocean, on the south by Florida, and on the west by Alabama. Georgia is the largest State east of the Mississippi, the area being 59,475 square miles, of which 495 square miles is water. The extreme length from north to south is 320 miles, and the greatest breadth 259 miles.

TOPOGRAPHY. The State lies in both the Appalachian and coastal plain regions, so that the surface is divided between highlands and lowlands. The eastern chain (Blue Ridge) of the Appalachians, after crossing the North Carolina boundary, terminates in the northern part of the State. It has an elevation of from 3000 to 5000 feet, the latter limit being attained by only a few peaks, of which the highest is Sitting Bull Mountain, 5046 feet above the sea. Bordering the Blue Ridge on the west is the Cohutta group, a continuation of the Unaka Mountains of Tennessee, while the northwestern corner of the State is crossed by the Lookout and Sand Mountain ranges of the Alleghanies, which terminate in Alabama. An area of about 6000 square miles in northern Georgia has an elevation of 1000 feet or more. South of the Appalachian foothills there is a broad area of uplift, the Piedmont plateau, sloping toward the Atlantic, and terminating near the middle of the State in the coastal plain. From the southern limit of the plateau region to the Florida and Atlantic borders, the surface is little diversified except where dissected by erosion into low hills and stream-valleys. The lands bordering directly on the coast are flat, and but slightly raised above sea-level. The Okefinokee Swamp, which extends across the State line into Florida, occupies an area 45 miles long by 30 miles wide. It contains several open lakes, but there are numerous islands and intersecting ridges that support heavy forests. Chickamauga National Military Park (q.v.) is situated in the northwest corner of the State.

Georgia has an extensive drainage system, including a few rivers of moderate size. The Savannah River, on the eastern boundary, drains most of the eastern section. It is navigable for ocean-going craft to Savannah, and for boats of 150 tons to Augusta. The Altamaha, with its head-streams, the Oconee and the Ocmulgee, flows through the central part, and its waters are open to navigation by light-draught boats as far as Milledgeville and Macon. Western Georgia lies largely within the basin of the Appalachicola, which is formed by the confluence of the Flint and Chattahoochee rivers, both rising in the northern part of the State. Boats ascend the Flint to Albany, and the Chattahoochee to Columbus. Among the other important streams are the Ogeechee, Satilla, and the Withlacoochee. When the rivers pass from the plateau region to the coastal plain, cataracts and waterfalls are usually present; they are located approximately along a line running through Augusta, Macon, and

Columbus, and are the source of the industrial activity of these cities.

CLIMATE AND SOIL. The climate of Georgia shows a wide range between the mountains, where the average annual temperature falls below 40° F., and the extreme south, where the average reaches 70°. In southern Georgia the climate resembles that of northern Florida; the winters are mild with few frosts and rarely snow, the summers long and hot. The northern part has a salubrious climate, the winters and summers being free from extremes. The mean temperatures for the year in the leading cities are as follows: Atlanta, 61°; Augusta, 64°; Athens, 63°; Rome, 62°; Americus, 68°; and Brunswick, 69°. The rainfall is greatest in the extreme north, and smallest in the eastern part, averaging about 49 inches for the whole State.

The soils exhibit a diversity of characters, corresponding to the difference in composition of the underlying rocks from which they have been derived. In the northern part sands and clays predominate, but in the extreme northwestern section, which is underlaid largely by limestone, the soil is loamy and possesses great fertility. Within the limits of the coastal plain the surface varies from sand to loam and heavy clay. The bottom lands along the rivers contain sufficient organic matter to make them extremely productive.

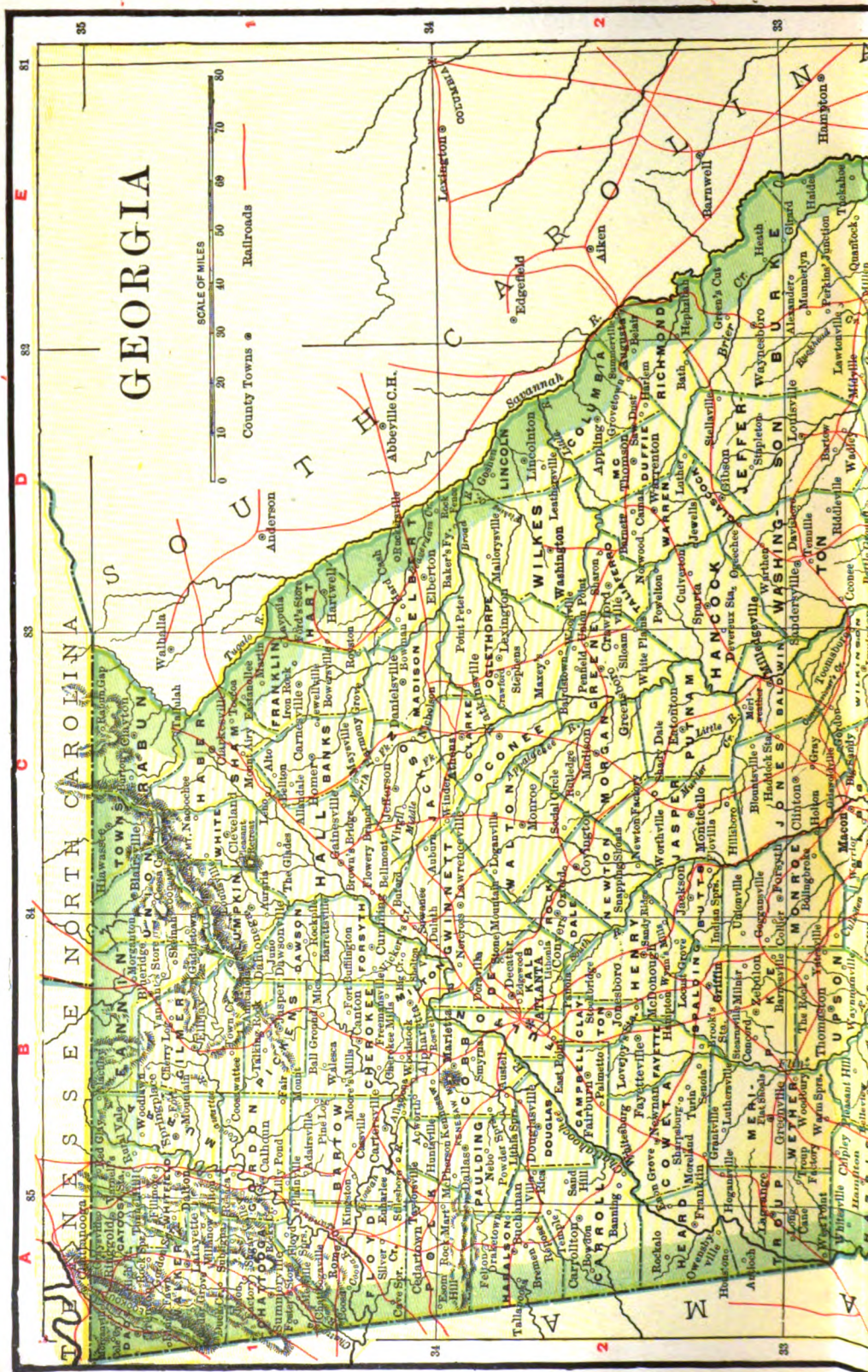
For Flora and Fauna, see paragraphs under **UNITED STATES**.

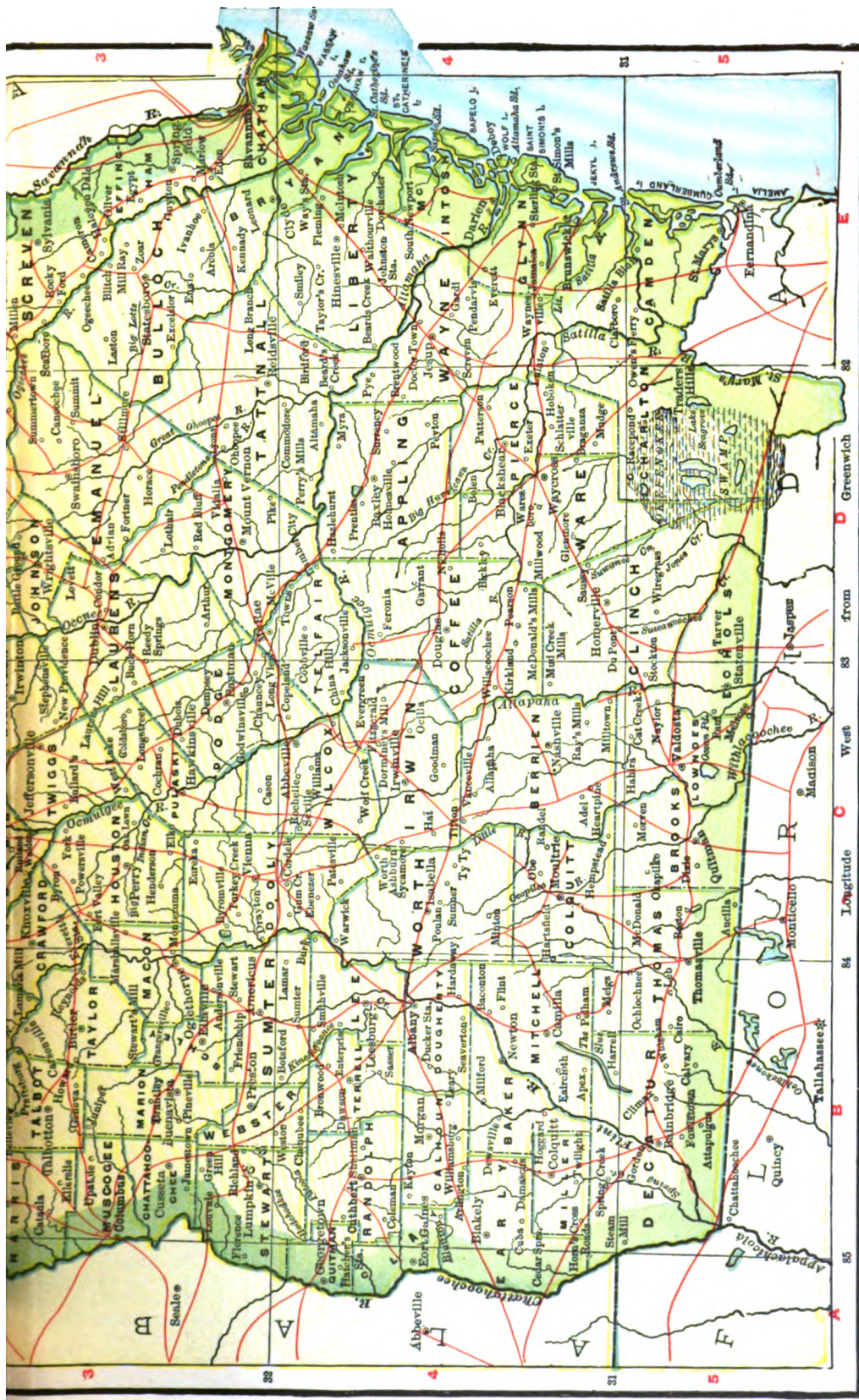
GEOLOGY. The State falls within three geological provinces or regions: the Paleozoic region in the northwest, which conforms approximately to the area occupied by the western chains of the Appalachians; the region of crystalline rocks comprising the remainder of northern Georgia, and extending southward of a line running through Augusta, Macon, and Columbus; and the coastal plain. In the Paleozoic region the rocks are mostly sandstones, limestones, and shales. The region of crystalline rocks is underlaid by granite and gneisses of Archæan age. Within the coastal plain the formations are loosely textured sands, clays, marls, and limestones, and belong to recent geological periods, the Tertiary and Quaternary.

MINERAL RESOURCES. Gold was found in White County in 1829, and ten years later the gold-mining industry had reached such importance that a branch mint was established at Dahlonega. Both quartz and placer mines occur, but most of the output at the present time is made from the former type of deposits, which occur along the southern slopes of the Blue Ridge. Iron ore is mined at several localities in the Paleozoic region, where there are also valuable deposits of ochre, manganese, and bauxite under exploitation. Among non-metallic products, coal, clay marble, and granite are most important. The coal-fields are located in Dade and Walker counties, and are an extension of the Warrior field of Alabama. Brick-clays and fire-clays are widely distributed throughout the State, but mining is limited practically to localities near the larger towns. The marble industry for several years past has steadily grown in importance, owing to the reputation which Georgia marble has gained all over the United States as a valuable building and ornamental stone. Various qualities of granite suitable for building, street

AREA AND POPULATION OF GEORGIA BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Appling.....	D 4	Baxley	775	8,676	12,896
Baker.....	B 4	Newton.....	366	6,144	6,704
Baldwin.....	C 2	Milledgeville.....	250	14,608	17,768
Banks.....	C 1	Homer.....	216	8,582	10,545
Bartow.....	B 1	Cartersville.....	485	20,616	20,823
Berrien.....	C 4	Nashville.....	810	10,694	19,440
Bibb.....	C 3	Macon.....	254	42,370	50,473
Brooks.....	C 5	Quitman.....	463	13,979	18,606
Bryan.....	E 3	Clyde.....	427	5,520	6,122
Bulloch.....	E 3	Statesboro.....	980	13,712	21,377
Burke.....	E 2	Waynesboro.....	1,043	28,501	30,165
Butts.....	C 2	Jackson.....	179	10,565	12,905
Calhoun.....	B 4	Morgan.....	376	8,493	9,274
Camden.....	E 5	Saint Marys.....	718	6,178	7,669
Campbell.....	B 2	Fairburn.....	205	9,115	9,518
Carroll.....	A 2	Carrollton.....	486	22,301	26,576
Catoosa.....	A 1	Ringgold.....	171	5,431	5,823
Charlton.....	D 5	Traders Hill.....	1,063	3,335	3,592
Chatham.....	E 3	Savannah.....	400	57,740	71,239
Chattahoochee.....	B 3	Cusseta.....	231	4,902	5,790
Chattooga.....	A 1	Summerville.....	396	11,202	12,952
Cherokee.....	B 1	Canton.....	434	15,412	15,243
Clarke.....	C 2	Athens.....	159	15,186	17,708
Clay.....	A 4	Fort Gaines.....	216	7,817	8,568
Clayton.....	B 2	Jonesboro.....	142	8,205	9,598
Clinch.....	D 5	Homerville.....	1,077	6,652	8,732
Cobb.....	B 2	Marietta.....	341	22,286	24,664
Coffee.....	D 4	Douglas.....	1,123	10,483	16,169
Colquitt.....	C 4	Moultrie.....	565	4,734	13,896
Columbia.....	D 2	Appling.....	306	11,281	10,653
Coweta.....	B 2	Newnan.....	449	22,354	24,980
Crawford.....	C 3	Knoxville.....	334	9,315	10,368
Dade.....	A 1	Trenton.....	188	5,707	4,578
Dawson.....	B 1	Dawsonville.....	209	5,612	5,442
Decatur.....	B 5	Bainbridge.....	1,010	19,949	29,454
Dekalb.....	B 2	Decatur.....	271	17,189	21,112
Dodge.....	C 3	Eastman.....	495	11,452	13,975
Dooly.....	C 3	Vienna.....	710	18,146	26,567
Dougherty.....	B 4	Albany.....	339	12,306	13,679
Douglas.....	B 2	Douglasville.....	212	7,794	8,745
Early.....	B 4	Blakely.....	503	9,792	14,638
Echols.....	C 5	Statenville.....	365	3,079	3,209
Effingham.....	E 3	Springfield.....	419	5,599	8,334
Elbert.....	D 1	Elberton.....	388	15,376	19,729
Emanuel.....	D 3	Swainsboro.....	936	14,703	21,279
Fannin.....	B 1	Blueridge.....	390	8,724	11,214
Fayette.....	B 2	Fayetteville.....	215	8,728	10,114
Floyd.....	A 1	Rome.....	506	28,391	33,113
Forsyth.....	B 1	Cumming.....	252	11,155	11,550
Franklin.....	C 1	Carnesville.....	344	14,670	17,700
Fulton.....	B 2	Atlanta.....	174	84,655	117,363
Gilmer.....	B 1	Ellijay.....	450	9,074	10,198
Glascocock.....	D 2	Gibson.....	95	3,720	4,516
Glynn.....	E 4	Brunswick.....	468	13,420	14,317
Gordon.....	B 1	Calhoun.....	387	12,758	14,119
Greene.....	C 2	Greensboro.....	400	17,051	16,542
Gwinnett.....	B 2	Lawrenceville.....	510	19,899	25,585
Habersham.....	C 1	Clarksville.....	372	11,573	13,604
Hall.....	C 1	Gainesville.....	449	18,047	20,752
Hancock.....	C 2	Sparta.....	523	17,149	18,277
Haralson.....	A 2	Buchanan.....	282	11,316	11,922
Harris.....	A 3	Hamilton.....	486	16,797	18,009
Hart.....	D 1	Hartwell.....	257	10,887	14,492
Heard.....	A 2	Franklin.....	313	9,577	11,177
Henry.....	B 2	McDonough.....	337	16,220	18,603
Houston.....	C 3	Perry.....	591	21,613	22,641





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AREA AND POPULATION OF GEORGIA BY COUNTIES.

(Continued.)

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Irwin	C 4	Irwinville	686	6,316	13,645
Jackson	C 1	Jefferson	460	19,176	24,089
Jasper	C 2	Monticello	410	13,879	15,083
Jefferson	D 2	Louisville	686	17,213	18,212
Johnson	D 3	Wrightsville	258	6,129	11,409
Jones	C 2	Clinton	397	12,709	18,359
Laurens	D 3	Dublin	791	13,747	25,909
Lee	B 4	Leesburg	436	9,074	10,344
Liberty	E 4	Hinesville	976	12,887	13,093
Lincoln	D 2	Lincolnton	290	6,146	7,156
Lowndes	C 5	Valdosta	455	15,102	20,036
Lumpkin	B 1	Dahlonega	282	6,867	7,433
McDuffie	D 2	Thomson	258	9,789	9,804
McIntosh	E 4	Darien	429	6,470	6,567
Macon	B 3	Oglethorpe	392	13,183	14,093
Madison	C 1	Danielville	278	11,024	13,224
Marion	B 3	Buena Vista	344	7,728	10,080
Meriwether	B 2	Greenville	544	20,740	23,339
Miller	B 4	Colquitt	275	4,275	6,319
Milton	B 2	Alpharetta	147	6,208	6,763
Mitchell	B 4	Camilla	542	10,906	14,767
Monroe	C 3	Forsyth	480	19,137	20,642
Montgomery	D 3	Mount Vernon	744	9,248	16,359
Morgan	C 2	Madison	346	16,041	15,813
Murray	B 1	Springplace	352	8,461	8,623
Muscogee	B 3	Columbus	255	27,761	29,836
Newton	C 2	Covington	259	14,310	16,734
Oconee	C 2	Watkinsville	184	7,713	8,602
Oglethorpe	C 2	Lexington	575	16,951	17,881
Paulding	B 2	Dallas	329	11,948	12,969
Pickens	B 1	Jasper	219	8,182	8,641
Pierce	D 4	Blackshear	518	6,379	8,100
Pike	B 2	Zebulon	294	16,300	18,761
Polk	A 2	Cedartown	292	14,945	17,886
Pulaski	C 3	Hawkinsville	477	10,559	18,489
Putnam	C 2	Eatonton	348	14,842	13,436
Quitman	A 4	Georgetown	152	4,471	4,701
Rabun	C 1	Clayton	344	5,006	6,285
Randolph	B 4	Cuthbert	476	15,267	16,847
Richmond	D 2	Augusta	272	45,194	53,785
Rockdale	B 2	Conyers	121	6,813	7,515
Schley	B 3	Ellaville	188	5,443	5,499
Scriven	E 3	Sylvania	734	14,424	19,252
Spalding	B 2	Griffin	203	13,117	17,619
Stewart	B 3	Lumpkin	440	15,682	15,856
Sumter	B 3	Americus	534	22,107	26,212
Talbot	B 3	Talbotton	407	13,258	12,197
Taliaferro	D 2	Crawfordville	198	7,291	7,912
Tattall	D 3	Reidsville	1,102	10,253	20,419
Taylor	B 3	Butler	338	8,666	9,846
Telfair	C 4	McRae	412	5,477	10,083
Terrell	B 4	Dawson	340	14,503	19,023
Thomas	B 5	Thomasville	713	26,154	31,076
Townsend	C 1	Hawassce	168	4,064	4,748
Troup	A 2	Lagrange	434	20,723	24,002
Twiggs	C 3	Jeffersonville	423	8,195	8,716
Union	C 1	Blairsville	325	7,749	8,481
Upson	B 3	Thomaston	310	12,188	13,670
Walker	A 1	Lafayette	433	13,282	15,061
Walton	C 2	Monroe	366	17,467	20,942
Ware	D 4	Waycross	676	8,811	13,761
Warren	D 2	Warrenton	298	10,957	11,463
Washington	D 3	Sandersville	680	25,237	28,227
Wayne	E 4	Jesup	766	7,485	9,449
Webster	B 3	Preston	227	5,695	6,618
White	C 1	Cleveland	243	6,151	5,912
Whitfield	A 1	Dalton	285	12,916	14,509
Wilcox	C 4	Abbeville	544	7,980	11,097
Wilkes	D 2	Washington	501	14,081	20,866
Wilkinson	C 3	Irwin	431	10,781	11,440
Worth	B 4	Isabella	778	10,048	18,664

paving, and monumental work are quarried, and the State's resources in this stone are inexhaustible. Among the other mineral products of Georgia are silver, copper, pyrite, graphite, asbestos, talc, mica, barite, slate, marl, limestone, and sandstone.

MINING. The marble-quarries had no commercial value prior to 1884. Prior to 1894 the annual value of the product was less than \$300,000, but in that year it advanced to over \$700,000, where it has since remained. The granite-quarries yield an annual product valued at more than \$400,000. Some limestone is quarried and converted into lime. The output of coal for the last decade in the nineteenth century averaged about \$250,000 annually; that of iron ore almost reached that amount. The total gold production of the State from 1829 to 1900, inclusive, is estimated at \$16,891,000; the recent production amounts to about \$150,000 in annual value. Bauxite, first mined in 1889, has, during the decade, varied from 1000 to 7000 tons in annual production. The State produces nearly one-half the manganese obtained in the United States.

FISHERIES. There were in 1897 1800 men employed in the fisheries of Georgia, and the product for that year was valued at \$170,600, an increase of 38 per cent. over 1890. Oysters and shad constituted the bulk of the catch.

AGRICULTURE. Agriculture is the leading industry of the State. Of the total land area 69.9 per cent. (1900) is included in farms, and of this 40.2 per cent. is improved. The largest farm acreage recorded was in 1800, but the largest improved acreage was reached in 1900, a large increase having been made in each decade since 1870. The large plantations have been broken up and rented to negro farmers. The average size of farms has consequently decreased until in 1900 it was 117.5 acres, a little over one-fourth as large as that in 1850, while the rented farms have increased rapidly in number, amounting in 1900 to 59.9 per cent. of the total. About 37 per cent. of the farms are operated by colored farmers, and over 86 per cent. of these are rented. The negro farmer limits himself largely to the raising of cotton—being encouraged in this by the prevailing system of crop mortgaging, and by his disinclination to adopt new methods. As a result three-fourths of the total number of farms cultivated by negroes are rented and devoted to the raising of cotton.

of the total crop receipts. The Civil War resulted in a decrease in the area devoted to cotton, but since 1870 every decade has shown an increase. For several years Georgia has ranked second among the cotton-growing commonwealths. Georgia is the largest producer of sea-island cotton, although this variety covers less than five per cent. of its cotton-growing area. Cotton has been so long king in Georgia that little improvement was observed as regards general agriculture until latterly, when there has been a marked advance. Cereals are of especial importance in the northern part of the State. Corn, the leading cereal, as indicated above, represents almost five times the area of all the other cereal crops. In the last decade of the century the acreage of corn increased 34.7 per cent. Oats and wheat are of about equal importance. In the last decades of the nineteenth century there were large decreases in the acreage of oats, and in the period 1880-90 this decrease was also shared by wheat, which, however, revived in the following decade. The yield per acre of cereals is small. Rice constitutes an important crop in the coast counties, where in 1900 63.4 per cent. of its entire acreage was located. The hay and forage crops are relatively of little importance. Sugar-cane is grown in increasing quantities, and the larger part of the crop is used in the manufacture of syrup. Some sorghum is also raised. Georgia ranks second among the States in the raising of peanuts, the area devoted to them having almost doubled in the decade 1890-1900, the extreme southern counties being the largest producers. In recent years fruit and vegetable growing has increased rapidly. The sweet potato is the most important vegetable, in the production of which the State ranks next to North Carolina. Owing to its situation, the State commands the earliest Northern markets for vegetable and fruit products. The State ranks first in the production of watermelons, with an acreage of 27,874 reported in 1900. The number of peach-trees increased from 2,787,000 in 1890 to 7,668,000 in 1900, constituting in the latter year 68.2 per cent. of the total number of fruit-trees of all varieties. Small plants are not extensively cultivated.

The following comparative table, taken from the census returns of 1900, includes the most important farm crops and varieties of farm animals, and shows the changes which have occurred during the decade ending with that year:

YEAR	Cotton, acres	Corn, acres	Oats, acres	Wheat, acres	Rice, acres	Hay, acres	Sugar, acres	Potatoes (sweet), acres	Peanuts, acres
1900.....	5,343,063	3,477,684	318,433	319,161	21,998	137,312	26,056	70,620	100,589
1890.....	3,345,104	2,582,316	519,886	196,633	18,126	68,318	20,238	71,399	52,226

YEAR	Dairy cows	Other neat cattle	Horses	Mules and asses	Sheep	Swine
1900.....	276,024	623,467	127,407	207,840	258,894	1,424,296
1890.....	287,717	586,209	103,501	157,377	440,459	1,396,362

In the swampy regions in the southern part of the State there is much waste land, and also in the mountains of the northern part. Between these two sections lies the cotton belt. The total area devoted to cotton exceeds that of any other crop, amounting in 1899 to 41.8 per cent. of the total crop area, and yielding 56.7 per cent.

STOCK-RAISING. As is common in regions where cotton is the principal crop, stock-raising is not of very great importance. While there was a significant increase in the industry during the last decade of last century, it has not regained the prominence it held prior to the Civil War. With the exception of mules and asses, more

domestic animals of all kinds were reported in 1850 than in any succeeding census year. The increase in cotton production after the Civil War diminished the grazing area, and hindered the revival of the stock-raising industry. It is noteworthy that whereas horses greatly outnumbered the mules prior to the Civil War, this ratio is now reversed.

MANUFACTURES. Because of its industrial importance, Georgia has long been known as the 'Empire State of the South,' and has played a leading rôle in the recent industrial awakening of that section. A number of conditions favor the growth of manufacturing interests, chief of which is the great annual output of raw material. While outranked by the Carolinas in the manufacture of cotton, and by Alabama in that of iron, Georgia has a greater variety of manufacturing interests, and excels these two States in the sum total of manufactured products. The wide distribution of water-power is another favorable factor, as is also the cheaper labor

value of the product from \$12,000,000 to \$18,500,000. A noteworthy beginning was made in the manufacture of hosiery and knit goods. Still more striking was the progress made in the manufacture of cottonseed oil and cake. The oil is used in the production of oleomargarine, cottolene, compound lard, for illuminating purposes, and as a substitute for olive oil. The cake or meal is valuable for stock food, and is also used in the manufacture of commercial fertilizers, in which Georgia outranks the other Southern States. The State exceeds all others in the manufacture of cotton-gins. The recent increase in wheat-raising resulted in giving a new impetus to the flour-milling industry, the value of the product of flour and grist mills having increased during the decade from \$5,200,000 to \$8,300,000. The car-shop and machine-shop products also show a good growth. The following table indicates the development during the last decade of the century of the eleven leading industries:

INDUSTRIES	Year	Number	Capital	Value of products including custom work and repairing
Total for selected industries for State.....	1900	3,301	\$61,341,596	\$72,715,693
	1890	1,673	38,425,143	41,763,950
Increase, 1890 to 1900.....	.....	1,628	\$22,916,453	\$30,951,743
Per cent. of increase.....	.....	97.3	59.6	74.1
Per cent. of total of all industries in State.....	1900	44.0	68.3	68.2
	1890	39.0	67.5	60.6
Textiles: Total.....	1900	98	\$25,606,170	\$20,266,712
	1890	71	18,084,708	12,375,724
Cotton goods (including cotton small wares).....	1900	68	24,222,169	18,544,910
	1890	53	17,664,675	12,035,629
Hosiery and knit goods.....	1900	16	928,887	1,230,801
	1890	4	121,484	166,850
Woolen goods.....	1900	14	455,114	491,001
	1890	14	298,539	173,245
Oil, cottonseed, and cake.....	1900	43	4,098,668	8,064,112
	1890	17	992,131	1,670,196
Cars and general shop construction and repairs, by steam railroad companies.....	1900	32	1,408,592	3,062,283
	1890	11	450,512	892,610
Fertilizers.....	1900	41	6,663,618	3,367,353
	1890	44	5,501,881	5,026,034
Flouring and grist mill products.....	1900	1,123	2,504,033	8,330,439
	1890	719	2,347,835	5,190,311
Foundry and machine-shop products.....	1900	87	3,396,141	3,506,427
	1890	52	2,107,969	2,272,653
Lumber and timber products.....	1900	1,254	11,802,716	13,704,923
	1890	449	5,019,635	6,545,195
Lumber, planing-mill products, including sash, doors, and blinds.....	1900	99	2,074,226	4,302,976
	1890	82	1,677,880	3,548,972
Turpentine and rosin.....	1900	524	3,785,432	8,810,468
	1890	228	2,242,592	4,242,255

of the region—a result of the low cost of living. Again, the efforts of the State through expositions, technical education, and of the municipalities in exempting manufacturing establishments from taxation, have encouraged their growth. The number of wage-earners employed in manufacturing increased 60 per cent. during the last decade of the century, the census of 1900 showing that 5 per cent. of the total population were thus employed. Of these, 10,900 were women and 6370 children. The value of manufactured products increased during the decade from \$68,900,000 to \$106,600,000. The manufacture of cotton products leads in importance, and there are but three New England and two Southern States which surpass Georgia in this industry. The cotton-goods establishments increased from 53 in 1890 to 68 in 1900, and the

The four largest cities of the State produced less than one-third of the total product, their increase being 17.6 per cent. against 54.9 per cent. increase for the entire State.

FORESTS AND LUMBERING. The forests are almost as important as the cotton-fields as producers of raw materials. An area of 16,000 square miles, chiefly in the southern part of the State, is covered with forests of the long-leaf pine, while in the central and northern districts there are immense forests of hard woods, oak, hickory, maple, and other varieties. It is estimated that 71 per cent., or 42,000 square miles, of the State's area is forest-covered, of which 23,800 are included in farms, and 18,200 are not. The entire forest product almost doubled in value during the decade 1890-1900. The timber products in 1900, valued at \$13,700,000 (see

accompanying table), were largely of pine, which was shipped mainly to the Eastern States, though a portion of it went to foreign markets. The hard woods are largely used in the production of furniture. The planing-mill products, including sash, doors, etc., were valued at \$4,300,000. From the pine forests in the southern counties are secured enormous quantities of turpentine and rosin almost equal in value to the timber products themselves. The product increased during the decade from \$4,200,000 to \$8,000,800 in that region.

TRANSPORTATION AND COMMERCE. The superior transportation facilities of Georgia are largely responsible for its advanced industrial position among the Southern States. Railway construction dates from an early time. The Central of Georgia was built from Savannah to Macon in 1833. In 1860 the mileage of 1420 was exceeded by only five other States. The period from 1880 to 1890 showed an increase from 2460 to 4600 miles. In 1900 the mileage was 5650. There are 57 lines in the State, of which the longest are the Central of Georgia, Southern Railway, Seaboard Air Line, Plant System, and the Georgia. The State Railway Commission fixes rates, and the companies are subject to penalties for their violation. The railroads of Georgia no longer question the constitutionality of this commission. The State has recently taken a decided stand in behalf of good highways, and it now has several hundred miles of macadamized roads. The law enables the counties to assess special road taxes, besides a commutation tax on all males, and provides for the employment of convict or free labor. Many of the counties have taken advantage of these provisions. The number of large rivers offers advantages of water navigation to a large portion of the State. The Savannah on the east is navigable to Augusta, and the Chattahoochee on the west to Columbus, giving an outlet to the Gulf, while the intervening streams, Flint, Altamaha, and others, are navigable for considerable distances. The city of Rome, in the northwest portion of the State, has the advantages of water navigation through the Coosa and Oostanaula rivers. Though the coast-line is not extensive, there are the excellent harbors of Savannah, Brunswick, and Saint Mary's, the former ranking eighth in order of importance as to foreign commerce among American ports, being the largest Atlantic port south of Baltimore. The foreign exports from Savannah in 1901 exceeded \$46,738,967, and from Brunswick \$7,952,637. The largest part of this was manufactured cotton; other important items were naval stores (spirits of turpentine and rosin) and fertilizers.

BANKS. There were, in 1900, 171 State banks in operation, with \$8,735,327 capital, \$22,009,064 deposits, and \$27,753,942 loans. There were also 27 national banks with a capital of \$3,556,000, 22 private banks with \$605,123 capital, and 11 loan and trust companies with a capital of \$1,194,650. It is necessary to have a capital stock of \$25,000 in order to establish a State bank.

GOVERNMENT. The present Constitution was ratified by a vote of the people in December, 1877. Proposed amendments must receive a two-thirds majority vote in each House, and a majority vote of the electors qualified to vote for members of the Assembly, each amendment being

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voted on separately. A two-thirds vote of the members of each House is required in order to call a constitutional convention. The right of suffrage is limited to men twenty-one years of age who have been citizens of the State one year and of the county six months, and have paid assessed taxes, and registered.

EXECUTIVE. The Governor, Secretary of State, Comptroller-General, and Treasurer are elected by the people. The Governor, who holds office for two years, may serve two terms consecutively, but is then ineligible for four years. The President of the Senate and the Speaker of the House, respectively, succeed to the Governorship in case that office has become vacant. The Governor has the usual power of granting reprieves, pardons, etc. A two-thirds vote of each House overcomes the Governor's veto. The right of veto may be exercised against any item of an appropriation bill.

LEGISLATIVE. Senators (44) and Representatives (175) are chosen for two years. There are 44 Senatorial districts, composed of contiguous undivided counties. Representatives are elected from counties on the basis of population, and the counties can neither be joined nor divided. The elections are biennial in October of the even years. Sessions of the Legislature are annual, and limited to fifty days; pay of members is \$4.00 per day and mileage. The seat of a member of either House shall be vacated on his removal from the district or county from which he was elected. The House of Representatives has the power of impeachment and the Senate the right to try impeachments. Money appropriations must originate in the House of Representatives. The general appropriation bill can embrace only the ordinary expenses, and every other subject of appropriation must be included in a bill by itself. Every bill requires a majority vote of all the members elected to each House.

JUDICIAL. The Supreme Court consists of a chief justice and five associate justices, chosen by popular election for terms of six years. There is a Superior Court judge for each judicial circuit, the judge being elected by the General Assembly for the term of four years. The Superior Court must sit in each county not less than twice in each year. The powers of a court of ordinary and of probate are vested in an ordinary for each county, and in each militia district the voters elect a justice of the peace, whose term of office is four years, as is also that of the county ordinary. The people elect an Attorney-General for the State, and the General Assembly elects a Solicitor-General for each judicial court.

OTHER CONSTITUTIONAL AND STATUTORY PROVISIONS. Legal interest is seven per cent., and the rate allowed by contract is eight. Judgments outlaw in seven years, notes in six years, and open accounts in four years. Cruel treatment; habitual intoxication; willful desertion for three years; conviction for offense involving moral turpitude, and under which the person has been sentenced for two years or longer, are the chief causes for divorce. The concurrent verdicts of two juries at different terms of the court are necessary in order to secure a total divorce. Property owned by a woman at marriage and that subsequently gained by her are her own, and inalienable. The State cannot make an agreement with any corporation the effect of which is to lessen competition or encourage monopoly.

MILITIA. In 1898 the total organized militia of the State numbered 3963 men, of whom 390 were in the cavalry, 142 in light batteries, and 3416 in the infantry. In 1900 the total number of males of militia age was 409,186.

FINANCE. The State Constitution provides that the bonded debt of the State shall never be increased, except for war purposes, and that all debt created to supply deficiencies in revenue shall not exceed \$200,000. Constitutional limitations are also placed upon the debt-making power of the political divisions of the State. In September, 1900, the State debt amounted to \$7,831,500. The receipts for the fiscal year ending 1900 amounted to \$3,542,069, of which \$1,929,587 was raised by the general tax. After the school expenditures, the largest items of expenditure are for the public debt, and for pensions to Confederate soldiers and their widows.

POPULATION. The population of Georgia has remained remarkably stationary, the State never having risen above the ninth nor fallen below the thirteenth place in rank; at present holding the eleventh place among the States. It is, after Texas, the most populous of the Southern States, though the density of population (37.6 per square mile) is exceeded in some others. In 1790 the population was 82,500; in 1850, 906,000; in 1860, 1,057,000; in 1870, 1,184,000; in 1880, 1,542,000; in 1890, 1,837,000; in 1900, 2,216,000. The absolute gain for the last decade exceeded that of any preceding decade, and the per cent. of gain, 20.6, was almost identical with that of the United States. As is general throughout the South, the foreign-born element is very small (12,403), while the negro population (1,035,000) constitutes almost one-half the total for the State, surpassing that of any other commonwealth. The rate of increase among the negroes, however, during 1890-1900 was less than that among the whites. The negroes greatly predominate in the southern part of the State, in some of the counties outnumbering the whites four to one. In the mountainous portion north of Atlanta the ratio is reversed in favor of the whites. Among the negroes the females outnumber the males by about 1500. The State contains 19 places with a population in excess of 4000, constituting 13.9 per cent. of the total population. Four cities contain a population exceeding 20,000: Atlanta, 89,800; Savannah, 54,200; Augusta, 39,400; and Macon, 23,206. Atlanta is the capital. The State has 12 Representatives in the Lower House of Congress.

RELIGION. The Baptist and Methodist denominations predominate, the former having about half the religious membership of the State—368,000, of whom 175,000 are colored. The Methodists number (1900) 272,000, of whom 100,000 are colored. Of the smaller denominations, the Presbyterians have 18,000 members; the Catholics, 20,000; Christians, 9800; and the Congregationalists, 4300. There are 6200 Hebrews.

EDUCATION. The unsatisfactory state of education which has long existed in Georgia has been incidental to the unsettled and changing industrial conditions, and the strained social situation, complicated by the race problem. The rural problem in education, difficult of solution in States more fortunately conditioned, is especially aggravated in Georgia. Small schools are common, little having been done in the way of centralization. Each county has a supervisor,

and better supervision is gradually being exercised. A graded system is being adopted, and the efficiency of the teacher is being raised by means of numerous institutes and normal schools. The most determined efforts, however, are seriously handicapped because of the insufficiency of the school fund, for which the Constitution is partly responsible. It contains a provision requiring that before levies for the support of county schools shall be made, two successive grand juries shall recommend such levy, and that two-thirds of the qualified voters shall then ratify the action of the grand jury—a requirement most difficult to fulfill. The main dependence is therefore upon State taxes. The amount received from this source, though small, is increasing almost every year. From \$150,789 in 1880, it rose to \$638,656 in 1890, and to \$1,505,127 in 1900. Other public funds added to this, principally through local taxation, raised the total expenditure for 1900 to \$1,980,016, or a little over two dollars and a half for each child five to eighteen years old.

The rural teachers receive on an average less than \$130 per year. The school year is short, averaging only 112 days. The white schools are not infrequently extended by means of private subscriptions. The building of schoolhouses and their repair are very largely dependent upon private effort. In 1900 the number of children five to eighteen years of age was estimated at 786,920, of whom 482,673 were enrolled in the public schools. This was a marked increase in the per cent. of enrollment, and particularly in the attendance, over earlier years. No law making education compulsory has been passed. According to the census of 1900, there were 158,247 illiterate males of voting age, of whom 125,791 were colored. In 1900 over 52 per cent. of the negroes ten years of age and over were illiterate, only three States showing a higher per cent., but this was a decrease of nearly 10 per cent. for the decade ending with that year. The illiterate native whites ten years of age and over were less than 12 per cent. of the native white population of that age, a per cent. which was exceeded in eight other States and Territories.

High schools are maintained in the larger towns. The University of Georgia, located at Athens, was opened in 1801, and is the first chartered State university in America; the institution is assisted greatly through private munificence. The State also maintains a normal school at Athens; a normal and industrial school (for girls) at Milledgeville; the North Georgia Agricultural College, at Dahlonega; a State Industrial College for negroes near Savannah; and a technological school at Atlanta, under the management of the State University. Private or denominational interests have established a large number of institutions, varying greatly in magnitude and in the standard maintained, but called indiscriminately universities or colleges. The Baptists maintain Mercer University at Macon, and four other institutions for higher education. The Methodists maintain the Wesleyan Female College at Macon, Emory College at Oxford, and a number of others. The Presbyterians support the Oglethorpe University at Atlanta, and the Rome Female College at Rome. The Morris Brown College, Clarke University, Atlanta University, and Spelman Institute (female), all at Atlanta, are for colored students. Of the large

number of undenominational schools, the most noteworthy is the Lucy Cobb Institute at Athens.

CHARITABLE AND PENAL INSTITUTIONS. The State Lunatic Asylum is located near Milledgeville, and includes separate buildings for white and black inmates, free to bona fide citizens of Georgia. In 1900 it contained 2550 individuals, and there were 150 others confined in the county jails, the asylum having been filled to its utmost capacity. There are a State institution for the deaf and dumb at Cave Spring, and an academy for the blind at Macon. There are also private institutions, such as the Female Asylum at Savannah, the Augusta Orphan Asylum at Augusta, and orphan homes of the Methodist, Episcopal, Baptist, and Hebrew organizations.

A recently adopted State law puts the control of State convicts in the hands of agents or lessees. A State commission has administrative authority over the State institutions, and the above provision is carefully carried out. The same law seeks to attain the same end in control of county chain-gangs, but in this instance it is generally violated, as are also the provisions intended to prevent the products of their labor from coming into competition with the products of free labor, and to restrict the gangs to public works. Female convicts, infirm males, and all boys under fifteen years old are placed on a farm apart from able-bodied men.

HISTORY. Georgia was originally part of the vast domain of the Cherokee and Creek Indians, themselves the successors of a superior race, whose ruined mounds still exist. De Soto, in 1540, penetrated its interior, and Ribault, in 1562, visited its coast. Though included in the grant to the Carolina proprietors, the English did not occupy the region, and their claim was denied by the Spanish, who had already worked its mines. In June, 1717, the tract between the Savannah and Altamaha rivers, extending westward to the Pacific Ocean, was granted to Sir Robert Montgomery to be held as a distinct province under the title of the Margravate of Azilia. As it was not settled in the time required, it lapsed to the proprietors, from whom the British Government purchased, in 1730, seven-eighths of the territory, which it ceded by the charter of June 8, 1732, to a body of trustees organized for the purpose of "establishing the Colony of Georgia in America." Before this—February, 1732—the remaining one-eighth had been acquired from Lord Carteret. Chief among the trustees was General James Oglethorpe, who desired to found an asylum for the poor debtors of England and for the Protestant refugees of Europe. The Government desired to defend the Carolinas against the Spanish and Indians of Florida, and to divert from the Spanish and French their trade with the Cherokees. The Colony was the only one of the original thirteen to receive aid from the British Government. Oglethorpe landed at Charleston, January 13, 1733, and after negotiations with the Creek Indians, took up land on the site of Savannah, February 13th. The rules for the Colony required land to be held in tail male and on military service. The introduction of rum and of slaves was forbidden. In 1733 fifty Jewish colonists arrived, and these were followed in 1734 by Lutheran refugees from Germany (Salzburgers). In 1736 a colony of Highlanders ar-

rived, and with them John and Charles Wesley, whose strict religious discipline made them unpopular, and shortly led to their return to England. In 1738 George Whitefield founded the orphanage of Bethesda, near Savannah. Though generously aided, the Colony did not flourish. The system of land tenures was oppressive, the scarcity of servants hindered agriculture, and the absence of restrictions in South Carolina drew many settlers there. In 1738 many colonists petitioned for the introduction of slavery. In 1740 Oglethorpe led the troops of Carolina and Georgia in an invasion of Florida, and in 1742, by his strategy, drove off a Spanish fleet that attacked the forts on the Altamaha. Slavery was introduced in 1749, the system of land tenure was changed in 1750, and the first Provincial Assembly met at Savannah in January, 1751. In 1752 the charter was surrendered, and Georgia became a royal province. In 1753 the first General Assembly met at Savannah.

Well governed and generously treated by Parliament, Georgia had little cause to aspire after independence, but Saint John's Parish sent a delegate to the second Continental Congress in March, 1775, and its example was followed by the other parishes. In 1778 the British captured Savannah, and in 1779 Augusta and Sunbury. An attempt by the Americans and French to retake Savannah was unsuccessful (October, 1779), and it was held by the enemy till 1782. The first State Constitution was framed in February, 1777, and in January 2, 1788, the Federal Constitution was ratified. A second State Constitution was adopted in 1789, and a third in 1798, when the importation of slaves was forbidden, and the boundaries of the State were defined as extending to the Mississippi on the west, and the Saint Mary's River on the south. The capital was moved to Louisville in 1795, and to Milledgeville in 1807. The enmity of the Indians had been aroused early in the history of Georgia; from 1783 to 1790 there were troubles with the Creeks and the Cherokees, and from 1790 to 1835 the lust for Indian lands was the chief force that shaped politics. In 1802 the State ceded its territory west of the Chattahoochee to the United States in return for \$1,250,000 and the promise that the Federal Government would undertake to extinguish peaceably all Indian titles within the State of Georgia. Large cessions were made by the Creeks to the United States in 1814, after they had been defeated in a sanguinary war, and the territory of the lower Cherokees was acquired in 1817. In 1825 the Creek Indians relinquished to the United States all their lands within the limits of Georgia, and Governor Troup, proceeding on the theory that the inherent title of the Commonwealth in the land had thus been freed from all incumbrance, ordered the survey of the relinquished territory. The Indians, however, repudiated their agreement on the ground of fraud, and this led to a conflict between the Governor and the National Administration (1826), in which the State successfully defied the power of the General Government. After the same manner, the Georgia Legislature, in 1827, extended the criminal jurisdiction of the State over a part of the lands held by the Cherokees, thus asserting the incompatibility of an Indian com-

monwealth existing within the limits of the State with the sovereign power of that State. The Supreme Court, in 1832, declared all such laws void, but its decision was disregarded by the State authorities. The Creeks were expelled in 1832, and in 1835 the Cherokees ceded to the United States all of the disputed territory, removing from the State in 1838.

The Whig Party was always strong in Georgia, and when the secession movement broke out there was a powerful Unionist element in the State. The radical party, however, prevailed and, on January 19, 1861, a convention passed an ordinance of secession by 208 votes against 89. During the war the State bore more than its share of misfortune. (For military operations in Georgia, see CIVIL WAR.) Great commercial depression was followed by actual deprivation. In 1863 there was want in northern Georgia, and in 1864 the northwestern part of the State was laid waste, and scores of thousands were living on Government bounty. At the end of the war it was estimated that four-fifths of the public wealth had been destroyed. The arbitrary acts of the Confederate Congress had been resented by the State authorities, and as early as 1863 there was a large faction in favor of reconstruction. The State was under military rule until June, 1865. On October 30th a convention of delegates at Milledgeville repealed the ordinance of secession; on November 7th the war debt of the State was repudiated, and a new constitution adopted; and on December 5th the Legislature ratified the Thirteenth Amendment. In 1866, however, the Legislature refused to ratify the Fourteenth Amendment, and by the reconstruction acts of March, 1867, Georgia came once more under military rule. A constitutional convention assembled in December, 1867, and in April 25, 1868, a new constitution was adopted by popular vote. The Legislature chosen at the same time complied with the demands of the reconstruction acts, and elected United States Senators. In July General Meade declared civil government restored, but as the Legislature afterwards expelled its colored members, on the ground of ineligibility, and failed to ratify the Fifteenth Amendment (1869), the State was again excluded from Congress, and again subjected to military rule, under which the expelled negroes were reseated, and the Fourteenth and Fifteenth amendments ratified, February, 1870. Georgia's representatives in Congress were not admitted till January, 1871. During this period trouble was caused by the Ku-Klux Klan (q.v.).

Business activity recommenced immediately after the war, and, owing to its splendid resources, the State prospered in spite of a long period of misgovernment. Under the wasteful administration of Rufus B. Bullock, Governor from 1868 to 1871, the public debt was increased from \$5,000,000 to \$16,000,000; the larger part of this debt was contracted through the fraudulent indorsement of railroad bonds, which the State later repudiated. Before 1880 charges of embezzlement were frequently brought against public officials, in particular against the State treasurers. Legislation during the period was concerned in great measure with railway affairs the railroads for the most part being under Government control. After 1880 economic development became especially marked as manufac-

tures of cotton, iron, steel, and oil spread over the northern part of the State, and the mining of coal grew to large proportions. The Cotton Exposition of 1881, and the Cotton States and International Exposition of 1898, both held at Atlanta, testified to the prosperity of the State. The division of races continued clean-cut; and though there was no disposition among the better class of whites to hinder the negro in the exercise of his civil rights, political equality was begrudged him, and social equality absolutely denied. As late as 1891 the Legislature decreed that separate public conveyances be provided for whites and negroes, and as late as 1897 the appointment of a negro as postmaster was made impossible by public opinion. Instances of mob law and racial feud were frequent after 1894.

In national politics the State was Democratic throughout the nineteenth century, except in 1840 and 1848, when it cast its electoral vote for the Whig candidate. In State politics, Georgia, since 1874, has been immaculately Democratic, and since 1882 the Republicans have not participated in the State elections. From 1890 to 1898, however, the Populist Party was very powerful. The present Constitution was adopted in 1877, when Atlanta was made the capital.

COLONIAL GOVERNORS

John Reynolds.....	1754-57
Henry Ellis.....	1757-60
James Wright.....	1760-76
Archibald Bullock.....(President of Georgia)	1776-77
Button Gwinnett.....	1777

STATE GOVERNORS

John A. Truetlen.....	1777-78
John Houston.....	1778-79
John Martin.....	1782
Lyman Hall.....	1783
John Houston.....	1784
Samuel Elbert.....	1785
Edward Telfair.....	1786
George Matthews.....	1787
George Handley.....	1788

UNDER FEDERAL CONSTITUTION

George Walton.....Democratic-Republican	1789-90
Edward Telfair.....	1790-93
George Matthews.....	1793-96
Jared Irwin.....	1796-98
James Jackson.....	1798-1801
David Emanuel.....	1801
Josiah Tattnall.....	1801-02
John Milledge.....	1802-06
Jared Irwin.....	1806-09
David B. Mitchell.....	1809-13
Peter Early.....	1813-15
David B. Mitchell.....	1815-17
William Rabun.....	1817-19
Matthew Talbot.....	1819
John Clark.....	1819-23
George M. Troup.....	1823-27
John Forsyth.....	1827-29
George R. Gilmer.....National Republican (later Whig)	1829-31
Wilson Lumpkin.....Democrat	1831-35
William Schley.....	1835-37
George R. Gilmer.....Whig	1837-39
Charles J. Macdonald.....Democrat	1839-43
George W. Crawford.....	1843-47
George W. B. Towns.....	1847-51
Howell Cobb.....	1851-53
Herschel V. Johnson.....	1853-57
Joseph E. Brown.....	1857-65
James Johnson.....	1865
Charles J. Jenkins.....	1865-67
Gen. T. H. Ruger.....Military	1867-68
Rufus B. Bullock.....Republican	1868-71
Benjamin Conley.....	1871-72
James M. Smith.....Democrat	1872-77
Alfred H. Colquitt.....	1877-82
Alexander H. Stephens.....	1882-83
Henry D. McDaniel.....	1883-86
John B. Gordon.....	1886-90
William J. Northen.....	1890-94
William Y. Atkinson.....	1894-99
Allen D. Candler.....	1899-1903
Joseph M. Terrell.....	1903

Consult: Jones, *The History of Georgia*, to 1783 (Boston, 1883); McCall, *History of Georgia*, to 1816 (Savannah, 1816); Stephens, *War Between the States* (Philadelphia, 1879); Avery, *History of Georgia from 1850 to 1881* (New York, 1884).

GEORGIA, STRAIT OF. The main section of the arm of the North Pacific Ocean which separates Vancouver Island from the mainland. It lies between Vancouver on the west and British Columbia on the east (Map: British Columbia, D 5). It averages perhaps 25 miles in width, and is comparatively deep, having soundings of over 1000 feet. It receives the water of the Fraser River (q.v.) and some smaller streams, and communicates with the open ocean by Queen Charlotte Sound in the north, and by the Strait of Juan de Fuca in the south.

GEORGIA, UNIVERSITY OF. An institution of higher education, chartered in 1785, and formally opened at Athens, Ga., in 1801. Its government is vested in a board of trustees appointed by the Governor. At the outbreak of the Civil War the faculty and most of the students joined the Confederate Army, and the institution remained closed until 1866. The proceeds of the sales of lands received by Georgia under the United States Land Grant Act of 1862 were transferred to the university in 1872, and the university, which in its inception was designed as a classical school, has, since the close of the Civil War, broadened its scope, and in 1902 comprised: Franklin College; the State College of Agriculture; the Graduate School; the Law School; the North Georgia Agricultural College, situated at Dahlonega; the Medical College, situated at Augusta; the School of Technology, situated at Atlanta; the Normal and Industrial School for Girls, situated at Milledgeville; the State Normal School; and the Industrial College for colored persons, which includes a well-equipped trade department. The total attendance, including 658 preparatory students, in 1902 was 2689. The library contains about 30,000 volumes, and the university owns twelve buildings. The running expenses of the university are partly defrayed by an annual State grant of \$8000.

GEORGIA BARK. See PINCKNEYA.

GEORGIAN (jôr'jan) **ARCHITECTURE.** The style of architecture in England prevailing during the reigns of the four Georges, and corresponding to the Colonial style in the United States. It was an adaptation of the Italian or Palladian style to English requirements, in which it lost the greater part of the sculpture and carved ornament of the Italian prototype, but gained, on the other hand, in freedom and picturesqueness of detail, and never fell into the extravagances and had taste of contemporary Italian work. Hawksmoor, James Gibbs, the architect of Saint-Martin's-in-the-Fields, London, Colin Campbell, the Adam brothers, Sir William Chambers, architect of Somerset House, London, Robert Taylor, and George Dance, are among the most notable architects of this period, to which American architecture owes the models which, in the second half of the eighteenth century, were followed generally in the design of the so-called Colonial churches and mansions of New England and the South. This neo-classic style was merged during the later Georgian period into the

modern style, and lasted, roughly, from c.1715 to 1800.

GEORGIAN BAY. An eastern extension of Lake Huron in the Province of Ontario, Can., about 120 miles long and 50 miles wide, and with depths exceeding 300 feet in the southwestern section (Map: Ontario, C 2). It is partly cut off from Lake Huron by a peninsular extension of Ontario and Manitoulin Island, and is connected with the lake by a short channel 20 miles wide south of this island, and by the long North Channel north of it.

GEORGIAN, or IBERIAN, or GRUSINIAN LANGUAGE. The principal language of the Caucasian group of dialects. This family of languages is divided into North and South Caucasian, the former group comprising Abkhasish, Avarish, Kasikumük or Lak, Arkish, Hürkanish, Kürinish, Udish, Tchetchentsish, and Thushish, and the latter division consisting of Georgian itself, Mingrelish, Lazish, and Suanish. The Caucasian languages, which are, broadly speaking, agglutinative in type, although they show inflection in many instances, are comparatively poor in vowels, but they abound in difficult combinations of consonants, especially of gutturals and sibilants. The noun and the verb are highly complicated, and the North Caucasian distinguishes in gender between the six categories of animate and inanimate, rational and irrational, masculine and feminine. The number system in most of the dialects is vigesimal. The Georgian is the only Caucasian dialect that has developed a literature; it begins with a translation of the Bible in the eighth century. This literature is written in a modified Armenian script, and it is quite considerable in extent. It embraces poetry, romance, history, and theology, and it reached the period of its highest development during the seventeenth and eighteenth centuries.

BIBLIOGRAPHY. The best general outline of the Caucasian languages, including Georgian, is that of Friedrich Müller in *Grundriss der Sprachwissenschaft*, vol. iii., sec. 2 (Vienna, 1887). Consult also: Erckert, *Die Sprachen des kaukasischen Stammes* (Vienna, 1895); Brosset, *Éléments de la grammaire géorgienne* (Paris, 1836); *Dictionnaire géorgien-russe-français* (Saint Petersburg, 1840); Leist, *Georgische Dichter verdeutsch* (Leipzig, 1887).

GEORGIANS. The Georgians, or Kartvelians, form the southern group of peoples of the Caucasus, which includes the following stocks, whose languages appear, though in part only distantly related, to have had a common origin: (1) The Georgians proper, or Grusians, with the Khevsurs, Thushes, Pshavs, and other mountain tribes, the Imers, the Gurians, etc.; (2) the Mingrelians, with the Lazes, Abkhasians, etc.; (3) the Suanitians, or Swans, of Kutais. Physically the Georgian peoples are of the white, not the yellow race, but rather mixed, the Georgians proper being brachycephalic, the Imers and Mingrelians more or less dolichocephalic; the Imers, too, have a less oval face, but Pantiukhoff (1893) considers them to represent best the primitive Georgian race, while Ripley (1899) takes the Mingrelian as typical of this group. The physical beauty of the men and women of the Georgians proper has long been famous, but Chantre (1885) and after him Ripley style it "a perfectly formal, cold, and unintelligent beauty, in no

wise expressive of character." Like the Circassians, the Georgians furnished slaves and women for the harems of Turkey, Egypt, etc. The ugliest and most degenerate representatives of the group are to be found among the Suanians, with whom goitre and cretinism prevail to a considerable extent. The Georgians have resided in their present habitat 4000-5000 years, and the human remains found in the caves of Kutais suggest a longer period for man's existence in this region. Some authorities, however, think that at the time of their appearance here the primitive Georgians were already somewhat cultured by earlier residence farther south in contact with ancient Aryan or Semitic civilizations in Asia Minor. Later on the Georgians seem to have furnished copper, antimony, etc., to these same civilized centres. Some hold that the primitive inhabitants of the region about Lake Van (the authors of the Vannic inscriptions, and the possessors of a certain amount of indigenous culture) and the so-called Mitani were of the Georgian stock. The Georgians proper are the best-known sections of the group. Russian intermixture appears to have stimulated to a certain degree the poetical and general literary genius of this people. Besides the material about the Georgians in von Erckert's *Der Kaukasus und seine Völker* (1887), and Chantre's *Recherches anthropologiques dans le Caucase* (1885-87), reference may be made to Leist's *Georgische Dichter verdeutscht* (1887); Wardrop's *The Kingdom of Georgia* (1888); Leist's *Georgien: Natur, Sitten und Bewohner* (1885), etc.

GEORGIAN SERIES. See CAMBRIAN SYSTEM.

GEORGIAN VERSION. See BIBLE.

GEORGICS, jôr'jiks. A didactic poem by Vergil, begun at the suggestion of Mæcenas, and dedicated to him. It is an agricultural work in four books, of which the first treats of the cultivation of the fields, the second of trees, the third of horses and cattle, and the fourth of bees. Around these subjects Vergil collected all the experience of the old Italians, and associated them with great beauty of style and illustration. The poem is in hexameters, and represents the most perfect work of the poet in versification. It was composed between B.C. 37 and 30.

GEOTEUTHIS (Neo-Lat., from Gk. γῆ, *gê*, earth + τευθίς, *teuthis*, cuttlefish). A fossil cuttlefish-bone, found in the Upper Liassic beds of England, Germany, and France. Its form is that of a flat, thin wedge. Its chief interest lies in its frequent association with the petrified ink-bag of the same animal. This ink-bag has been hardened to a glistening black mass, which can be dissolved and used for water-color drawing in much the same manner as is the modern sepia. See articles CEPHALOPODA; CUTTLEFISH; SEPIA; SQUID.

GEOTROPISM IN PLANTS (from Gk. γῆ, *gê*, earth + τροπή, *trôpê*, a turning, from τρέπειν, *trepein*, to turn). The sensitiveness of plant organs to gravity. The attraction of the earth acts as a stimulus to which the organ responds in a manner comparable to that exhibited in heliotropism, chemotropism, etc. Different organs respond to this stimulus in different ways. Primary roots (i.e. those originating from the embryo itself) are positively geotropic. They normally grow

with their tips directed toward the centre of the earth. If placed in any other position they bend so that the axis of the growing portion regains its normal direction. In these organs the receptive (or perceptive) region is in the extreme tip,

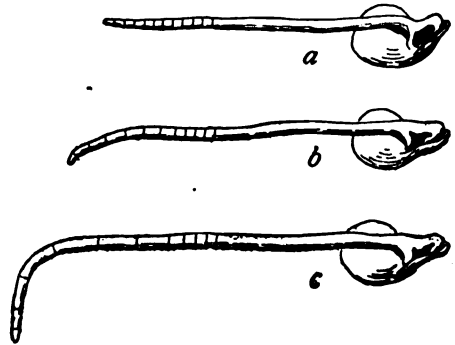


FIG. 1. POSITIVE GEOTROPISM.

Root of pea: a, with terminal portion marked into zones 1 mm. long and laid horizontal; b, the same after 6 hrs.; c, the same after 24 hrs. The 3d to 7th zones have grown most in length. The curvature is not usually so sharp, but all growing zones bend.

while the active or curving region lies two or three millimeters back of the tip. The attraction of gravity sets up a disturbance (the nature of which is not yet certainly known) in the receptive region, and this is propagated backward through the intervening cells to the region of curvature. Here the disturbance causes an alteration in growth such that the side of the root directed upward grows more rapidly than the other side, thus producing a curvature which ultimately directs the tip downward again (Fig. 1). Many other plant organs besides primary roots are positively geotropic. Among these are the rhizoids (q.v.) of many lower plants, stalks of certain fruits and fruit clusters, many aerial roots, etc.

The primary shoots of most plants are apogeotropic (negatively geotropic)—i.e. they

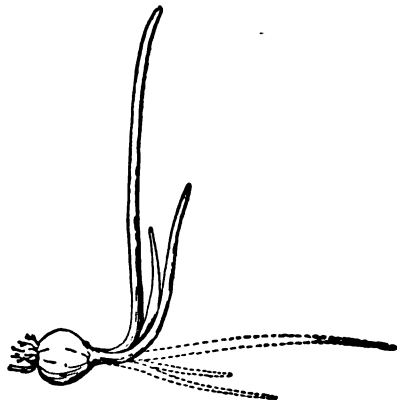


FIG. 2. NEGATIVE GEOTROPISM.

Radical leaves of onion with basal growth, which have erected themselves from the horizontal, because growth on under side is accelerated by gravity.

normally direct their tips away from the centre of the earth. This kind of sensitiveness is called apogeotropism or negative geotropism (Fig. 2). In such organs the receptive region is

not so well marked off from that of bending as in roots. It may extend throughout the whole growing region. Also any region where growth is taking place has the power of curving under this influence. The response is similar to that in roots, but in shoots the region where growth is accelerated is on the under side when placed horizontal. In certain regions where growth has ceased it may be renewed under the influence of geotropic stimulation, and curvature may then ensue. Examples of this are found in the mature joints of grass-stems; also in those of the common wandering-Jew (*Tradescantia*). These bend sharply when placed horizontal, in which position they are stimulated by gravity (Fig. 3).

Many organs, such as ordinary foliage leaves, lateral branches, lateral roots, rhizomes, runners, etc., usually show another form of response to this stimulus. Their normal position is horizontal, and, if displaced, they return to this position by bending. This tendency is dependent on diageotropism. The stalks of certain flowers, such as those of *Narcissus* and pansy, are diageotropic, so that the flower faces laterally. In dorsiventral organs, e.g. many leaves, diageotropic response may consist of two movements, a curvature which results in bringing the main axis into the horizontal plane, and a torsion of the whole organ which brings its two surfaces into their normal relation to the surface of the earth.

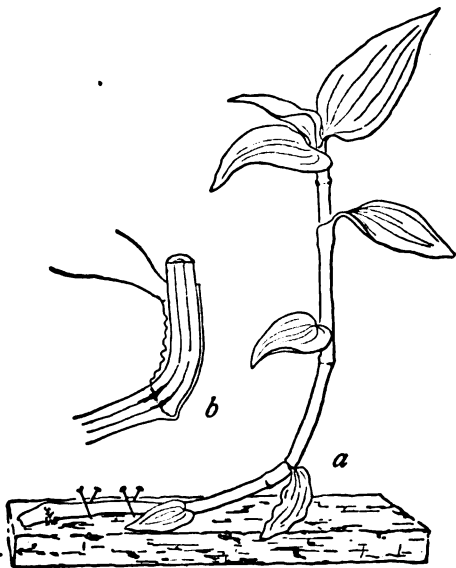


FIG. 3. NEGATIVE GEOTROPISM.

a, A shoot of *Tradescantia*, pinned to cork by lowest internode in a horizontal posture, has erected its tip, because the growth of the base of each internode has been accelerated by the stimulus of the gravity; b, a longitudinal section through the growing region of an internode after induced growth.

Still another form of geotropic curvature is shown by the growing regions of twiners, like the hop (Fig. 4), morning-glory, and bean. If the tip of the stem of such a plant be directed upward, gravity will exert an influence upon it which results in the acceleration of growth along one side. This produces a lateral nodding. But as soon as the tip begins to nod, the region of

accelerated growth migrates to the flank. The apex is thereby swung to the right or left, describing an irregular circle, clockwise or counter-clockwise, according to the plant. What determines these directions is not known. It differs among species of the same family or the same genus, and in some cases even in the plants of the same species. The tendency to respond is termed lateral geotropism, and it is on account of this property that such plants are enabled to twine about a support.

All geotropically sensitive organs may be constrained to grow in a horizontal direction, in spite of the stimulus of gravity, if they are slowly rotated on a horizontal axis by means of a clinostat (q.v.). In order to produce bending the stimulus must affect the organ in a one-sided manner. When a plant is rotated on the clinostat all parts are successively directed toward the centre of the earth, for equal periods of time. Hence there is as much tendency to bend in one direction as in another, and the resultant growth is uniformly accelerated on all sides.

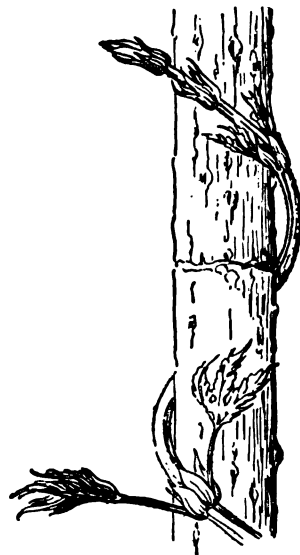


FIG. 4. LATERAL GEOTROPISM.

Tip of a twiner, the hop vine, showing low coils first formed, and the retarded development of the upper leaves. After Kerner.

Geotropism only in part determines the final position of subterranean plant organs. Hydrotropism, chemotropism, traumatotropism, etc., all have their effect, and the final position is the resultant of all these reactions. The position of aerial organs is determined largely by geotropism and heliotropism (q.v.). It is difficult to analyze any response and tell to what factor it is due. This can be done best by the use of the clinostat, varying the position of the axis according to the needs of the experiment. See also APOGEOTROPISM; DIAGEOTROPISM.

GEPHYRÆA (Neo-Lat. nom. pl., from Gk. γέφυρα, *gephyra*, bridge). A class of Annulata, containing certain marine worms devoid of segmentation in the adult condition, and the larvæ of which are typical trochospheres. The class includes *Siphunculus*, *Echinus*, *Bonellia*, and a few other forms.

GEPIDÆ, jép'ī-dē. A people of Gothic affinities, who in the third century lived on the shores of the Baltic, near the river Vistula. With the Goths they advanced southward and established themselves in what is now the western part of Hungary. They were subjugated by Attila (q.v.), but after his death rose and drove out the Huns. They were defeated by Theodoric the Ostrogoth King, in 489, and in 566 they were conquered by the Lombards. After this the name

disappeared, the remnants of the nation being swallowed up by the Avars.

GEPPERT, gēp'pĕrt, KARL EDUARD (1811-81). A German philologist. He was born at Stettin and was educated at Breslau, Leipzig, and Berlin, where he was professor from 1846 until his death. His works include: *Ueber die Aussprache des Lateinischen im ältern Drama* (1858); *Ueber den Ursprung der Homerischen Gesänge* (1840), a polemic directed against Ritschl; *Die altgriechische Bühne* (1843); and editions of the *Capituli* (1859); the *Truculentus* (1863); the *Pænulus* (1864); the *Epidicus* (1865); the *Casina* (1866); and other classics. His researches as to the Roman stage, especially as to the plays of Plautus, are valuable, and several public performances of the comedies *Trinummus*, *Menæchmi*, and *Rudens* were organized by him.

GERA, gā'rā (OHG. *Geraha*). The capital of the German Principality of Reuss (younger branch), situated on the White Elster about 44 miles east-southeast of Weimar (Map: Germany, E 3). It is well laid out, having been almost entirely rebuilt since the fire of 1780. One of the oldest and most prominent buildings is the Rathaus, erected in 1573-76, on the site of the old thirteenth-century building. The churches are of comparatively recent construction. The palace of the Prince, the theatre, and the post-office are noteworthy buildings. Gera has many excellent educational and benevolent institutions, including a number of manual schools. Its industrial output is important. Among the industries is the manufacture of woollens, introduced from Flanders at the end of the sixteenth century. Gera has an annual production of woollens of over \$14,000,000, and exports considerable quantities to the United States. Other manufactures are carpets, harmonicas, machinery, brick, leather, tobacco, jewelry, etc. There is also an extensive trade in oil, spirits, and drugs. Population, in 1890, 39,670; in 1900, 45,640, principally Protestants. Gera is first mentioned under its present name in the twelfth century, when it belonged to the Abbey of Quedlinburg. It passed to the House of Reuss at the beginning of the fourteenth century.

GERACE, jā-rā'chā. A city in South Italy, 60 miles northeast of Reggio, beautifully situated near the Ionian Sea, on a slope of the Apennines (Map: Italy, L 9). The ruins of the ancient city, Locri Epizephyrii, founded in the seventh century B.C., given laws in the sixth century by Zaleucus, and celebrated by Pindar and Demosthenes for its wealth and cultivation of art, are now concealed by an orange grove. The columns of the cathedral, which was rebuilt after the earthquake of 1783, are ancient. There are iron and coal mines and marble-quarries, and the soil of the district is rich, producing grain, olives, and grapes, the last of exquisite quality. Population of commune, in 1881, 9511; in 1901, 10,595.

GERAINT, ge-rānt'. A knight in the Arthurian legends. He appears in the *Mabinogion* romance, *Geraint the son of Erbin*, the source of which is Chrestien de Troyes's *Erec et Enide*, and in Tennyson's idyll *Geraint and Enid*.

GERALD DE BAR'RI. See GIRALDUS DE BARRI.

GERALDINE, jēr'al-dīn, THE FAIR. The lady to whom the Earl of Surrey's sonnets are ad-

dressed; now identified with Lady Elizabeth Fitzgerald, daughter of the ninth Earl of Kildare and, at the time the poems were begun (1537), only nine years old.

GERALDINI, jā'rāl-dē'nē, ALESSANDRO (1455-1525). The first Roman Catholic Bishop of Santo Domingo. He was born at Amelia, Italy, was educated as a soldier, and in 1475-76 served with the Spanish army against Portugal. Remaining in Spain, he took holy orders, became a friend and counselor of Archbishop Mendoza, of Toledo, and by him was introduced to the Court of Castile, where his learning won for him an appointment as tutor to the royal princesses. His influence at the Court of Ferdinand and Isabella is said to have obtained for Columbus his first interview with the sovereigns. Later in life Geraldini was engaged at various times on important diplomatic missions, both for the Papacy and for Spain, and held in succession the title to several Italian bishoprics. In 1520 he became the first Bishop of Santo Domingo, and proceeded at once to his new diocese, where he lived for the remainder of his life, and where he exerted his power and influence to make amends for the ruinous policy that had hitherto marked Spanish rule in the island. He wrote a valuable narrative of his voyage to America, and a description of Santo Domingo, in his *Itinerarium ad Regionem sub Equinoctiali Plaga Constitutas Alexandri Geraldini Amerini, Episcopi Civitatis S. Dominici apud Indos Occidentales* (1631). He is the author of a life of Catharine of Aragon, wife of Henry VIII. of England, in hexameter verse, and of several religious treatises.

GERANIA'CEÆ. See GERANIUM.

GERANIUM (Lat., from Gk. γέρανον, *geranon*, crane's-bill, from γέρας, *geranos*, crane). A genus of dicotyledonous plants, the type of the order Geraniaceæ, of which the most important genera are Geranium, Pelargonium, and Erodium. The genus embraces a large number of species, unequally distributed throughout the world. A dozen species are indigenous to Great Britain, of which number the stinking crane's-bill, or herb Robert (*Geranium Robertianum*), is a common weed. It is a low, spreading herb, with deeply divided leaves and small flowers, and has been used medicinally as an astringent. It is also found in parts of the United States. Alum Root (q.v.), a North American species, with flowers of considerable beauty, is the most valuable medicinally of all the species. It is very astringent and abounds in tannin, a character which belongs to some extent to many species of the genus. The common name, 'crane's-bill,' is given to many of the species of Geranium, on account of the long-beaked fruit, which in splitting aids in scattering the seeds. Geranium tuberosum, of Southern Europe, and Geranium dissectum, the wild carrot of Australia, produce edible tubers. The species of Geranium are not extensively cultivated, the plants so widely grown under that name being species of the genus Pelargonium, of which there are about 125 species, mostly natives of the Cape of Good Hope. These plants are prized on account of the colors of the flowers and the shape and marking of the leaves. Many hybrids have been produced, and there is hardly a better-known window plant. They are easily propagated by cuttings, requiring a light, rich soil and good drainage. A number of species

produce tuberous edible roots, as *Pelargonium triste*, of the Cape of Good Hope. The leaves of *Pelargonium acetosum* and *Pelargonium peltatum* are acid and edible. Two species of *Erodium* (*Erodium cicutarium* and *Erodium moschatum*, known as *Alfilaria*) occur abundantly over a large extent of the Pacific Coast region, where they are considered valuable forage plants, since they spring up rapidly after rains and furnish excellent pasturage, and are readily eaten when green by all kinds of stock. When dry they become very brittle, and are of little value. They seldom attain a height sufficient to admit of being cut for hay. A related species (*Erodium cygnorum*) is considered one of the most valuable forage plants for the drier portions of Australia.



GERANIUM.

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GÉRARD, zhá'rär', BALTHASAR (1558-84). A French religious fanatic. He was born at Villafons, Franche-Comté, and under the name of François Guion entered the service of William of Orange in order to assassinate the latter, which resolution he carried out July 10, 1584, as the Prince was leaving his palace at Delft. Gérard was put to death by quartering two weeks later. His family was afterwards ennobled by Philip II.

GÉRARD, CÉCILE JULES BASILE (1817-64). A French traveler, better known as 'Gérard the Lion-hunter.' His adventures in Algeria were chronicled in *La chasse au lions* (1855), and *Gérard, le tueur des lions* (1858). In 1863 he started on a tour of exploration in West Africa, and met his death by drowning the following year.

GÉRARD, CONRAD ALEXANDRE (1729-90). A French diplomat, brother of Gérard de Rayneval (q.v.), born at Massevaux, Upper Alsace. He entered the diplomatic service, and served as secretary of the French legation at Mannheim from 1753 to 1759, and secretary of the French Embassy at Vienna from 1761 to 1766. In July of the latter year he was recalled to Paris to become secretary of the Council of State and chief clerk in the Bureau of Foreign Affairs. Early in 1778, under instructions from Vergennes,

he conducted the negotiations with the American representatives, Franklin, Deane, and Lee, which resulted in the signing of the two treaties with the United States on February 6, 1778, by which France openly espoused the cause of the struggling Colonies. In March, 1778, he sailed to America with d'Estaing's fleet, as the first accredited Minister from France to the United States. This post he held until superseded by Luzerne, in September, 1779. His activity in America consisted chiefly in subsidizing writers—of whom Thomas Paine was the best known—to create a sentiment favorable to a closer French alliance, and in somewhat questionable relations with various members of Congress, who were the recipients of 'gifts' from him. His communications to Congress were, for the most part, oral addresses delivered at their secret sessions. During his residence in America he received the degree of LL.D. from Yale, and on his return to France was made a Councilor of State.

GÉRARD, ETIENNE MAURICE, Count (1773-1852). A Marshal of France, born at Damvilliers, in Lorraine. As a volunteer of 1792, he served under Dumouriez and Jourdan, and after the Peace of Campo-Formio (1797) went to Vienna with Bernadotte, whose chief of staff he became in 1805. His gallantry at Austerlitz (1805) made him brigadier-general. He was present at the battle of Jena (1806), and on the morning after Wagram (1809) he was made Baron of the Empire. He fought in Spain and in Russia, and practically gained the victory at Bautzen (1813) for Napoleon, who made him count and general of division. During the campaigns of 1814 he commanded at La Rothière and Montereau. After the first restoration he was named Grand Cross of the Legion of Honor, and Chevalier of Saint Louis, and received various high appointments. On the return of Napoleon from Elba, Gérard joined him, and fought splendidly under Grouchy at Ligny (June 16, 1815). Had his advice been followed, Grouchy would have gone more quickly to the aid of Napoleon, on the 18th of June, and Waterloo might have been averted. After the second restoration Gérard was obliged to leave France, and did not return till 1817. He was elected a member of the Chamber of Deputies in 1822; took an active part in the Revolution of 1830, and commanded the troops appointed to maintain order in Paris. In the same year Louis Philippe appointed Gérard Minister of War, a post which he resigned soon after. In the following year he was made Marshal of France, and given the command of the expedition to Belgium, in which he distinguished himself by taking Antwerp in December, 1832. In 1835 he succeeded Marshal Mortier as Grand Chancellor of the Legion of Honor.

GÉRARD, FRANÇOIS PASCAL, Baron (1770-1837). A French historical and portrait painter. He was born in Rome, March 4, 1770, and in 1782 came to Paris with his father, an employee of the French Ambassador in Rome. He first studied sculpture under Pajou, but soon took up painting under David (q.v.), and became one of his most famous pupils. His works are in the style of David, but somewhat superior in color. In 1789 he received a second-class medal for his picture "Joseph Recognized by His Brothers." In 1795 his "Blind Belisarius," now at

Saint Petersburg, attracted much attention. Of his remaining classical subjects the best known are: "Psyche Kissed by Cupid" (1798), in the Louvre; the "Three Ages" (1806), now in the Museum of Naples; "Homer" (1811) and "Daphnis and Chloe" (1824), also in the Louvre. He also painted large historical canvases, among which are the "Battle of Austerlitz" (1811) and the "Entrance of Henry IV. into Paris" (1814), in the Museum of Versailles. Both of these paintings are well known through engravings. The former was commissioned by Napoleon, who thought highly of Gérard; the latter brought him the title of Baron, and appointment as Court painter to Louis XVIII., and the cross of the Legion of Honor. Among his other famous paintings are the "Pestilence at Marseilles" and the "Coronation of Charles IX." (Versailles).

Gérard was also successful as a portrait painter, working in the smooth and elegant manner popular at that time, although he did not give much character to his subjects. The best of his portraits are perhaps those of the painter Isabey and of his daughter, in the Louvre. His portraits include those of Moreau, Talleyrand, Napoleon (Dresden), and two of Josephine, the Empress Marie Louise, and the King of Rome—three hundred in all. He died in Paris, January 11, 1837. Consult: Adam, *Les œuvres du Baron François Gérard* (Paris, 1852-57); Henri Gérard, *Correspondance de François Gérard* (ib., 1867).

GERARD, jè-rärd', JOHN (1545-1612). An English herbalist. He was born at Nantwich, Cheshire, and after spending some time in traveling, settled in London. For more than twenty years he acted as superintendent of the gardens of Lord Burghley, Secretary of State to Queen Elizabeth, and had a considerable reputation as barber-surgeon, becoming master of the company in 1608. In 1596 he published a catalogue of plants cultivated in his own garden, 1039 in number, inclusive of varieties of the same species. The following year appeared his well-known *Herball*, an adaptation of the *Stirpium Historiæ Pemptades* of Rembert Dodoens (1583). A second edition with considerable improvements and additions was brought out by Thomas Johnson in 1633, who also brought out a third in 1636. Linnaeus named the genus *Gerardea* in honor of Gerard.

GÉRARD DE NERVAL, zhá-rär' de nâr-väl', name adopted by Gérard Labrunie (1808-55). A French poet, dramatist, novelist, and miscellaneous writer, born in Paris. His translation of *Faust*, produced in 1828, gained Goethe's approval, and was in part adopted by Berlioz for his symphonic legend, *La damnation de Faust*. His short stories, *Les illuminés* and *Contes et facettes* (1852), suggest a mind verging on insanity; his *Scènes de la vie orientale* (1848-50) rank among the most brilliant pages in French of exotic description. Gérard's *Works* were collected in 5 vols. (1868). He died by suicide. For his biography, consult Delvan (Paris, 1865) and Tournoux (Paris, 1888).

GÉRARD DE RAYNEVAL, de rä'n-väl', JOSEPH MATHIAS (1746-1812). A French diplomat, brother of Conrad Alexandre Gérard (q.v.), born at Massevaux, Upper Alsace. He entered the French diplomatic service, in 1767, as chargé d'affaires at Ratisbon, and was promoted to a similar position at Danzig in 1769. In the fall

of 1782, while Franklin, Jay, and Adams were negotiating with the French and English representatives at Paris for the conclusion of peace in America, Vergennes secretly dispatched Gérard de Rayneval to London, primarily for the purpose of patching up difficulties between Spain and England. The American commissioners, however, got wind of the mission, and became convinced that Vergennes was dealing falsely with them, and that he was arranging a secret treaty with England whereby their western boundary, fishery rights, and so forth, would be restricted. It was this belief that led them to break off the three-cornered negotiations, and, contrary to the instructions of Congress, to conclude a preliminary treaty of peace with the British representatives without further consultation with Vergennes. From 1783 to 1792 Gérard de Rayneval was Minister to England, and conducted numerous negotiations during this critical period with great tact and ability. He lived in retirement during the Revolution, and after it engaged in journalism and the study of history and international law, on which he wrote several works of value, such as *Institutions du droit de la nature et des gens* (1803). Consult Masson, *Le département des affaires étrangères pendant la révolution* (Paris, 1877).

GÉRARDMER, zhá-rär'mär' (Fr., Lake of Gérard; named in honor of Gérard of Alsace, who built a tower on the shore of the lake about 1070). A pretty mountain town, capital of a canton in the Department of Vosges, France, on the Gérardmer Lake, about 33 miles by rail from Epinal (Map: France, N 3). It has a large trade in the well-known 'Gérome' cheese, and has some manufactures of linen. Owing to its picturesque position in the Vosges, it is well patronized, and is the usual starting-point of excursions into the mountains. Population, in 1901, 9104.

GERARDO DALLE NOTTI, jâ-rär'dô däl'lâ nôt'tè. See HONTHORST, GERARD VAN.

GERARD THE GREAT. See GROOTE.

GERASA, jër'à-sâ (Lat., from Gk. Γέρασα). A city of Palestine in Roman times, situated among the mountains of Gilead, about 20 miles east of the Jordan, a like distance north of Philadelphia, 22 miles from Pella, and 6 miles north of the Jabbok. It is now called Jerash, and has been identified by Sir George Grove with Ramoth-gilead. It is well watered by an unfailing stream which empties into the Jabbok. Gerasa is first mentioned as having been captured about B.C. 83 by Alexander Jannæus of the Maccabean line. It was rebuilt by the Romans in B.C. 65. Under Vespasian it was captured by Lucius Annius, plundered and burned. It was a member of the Decapolis (q.v.), and in the time of the Antonines (A.D. 138-180) was one of the most important cities of Syria. In early Christian times it was the seat of a bishopric, but subsequently sank into decay. The ruins are beautiful and extensive. Great portions of the wall are in good preservation, and many columns are still standing on their pedestals. There are remains of buildings and a triumphal arch. Photographs of the ruins were published by the Palestine Exploration Fund in 1867. It is hardly possible to connect Jerash with the 'country of the Gerasenes' mentioned in certain accounts as the scene of one of Christ's miracles. See GERASENES, COUNTRY OF THE.

GERASENES, gër'á-sénz, COUNTRY OF THE. Probably the true scene of the miracle of Jesus in connection with the legion of demons and the herd of swine (Matt. viii. 28-34; Mark v. 1-20; Luke viii. 26-39). The name of the people is variously given as Gadarenes, Gerasenes, and Gergesenes, the best readings, followed by the Revised Version, seeming to be Gerasenes in Mark and Luke, and Gadarenes in Matthew. The situation of Gadara (q.v.) does not meet the requirements, and Gergesenes is best explained as a not unnatural corruption of Gerasenes. It is out of the question, however, to refer the miracle to the neighborhood of Gerasa, the modern Jerash (see GERASA). The most probable identification is with the modern Kersa or Gersa, a ruined village on the east side of the Lake of Gennesaret, about half way between the northern and southern extremities.

GERBER, gër'bër, ERNST LUDWIG (1746-1819). A German musical lexicographer. He was born at Sondershausen, a son of Heinrich Nikolaus Gerber, Court organist in that city. After studying law at Leipzig, he devoted himself more exclusively to music, and succeeded to his father's position in 1775. For ten years he was engaged in collecting material from every part of Europe for his celebrated *Historisch-biographisches Lexikon der Tonkünstler* (1790-92), which work, though out of date, has never been excelled in Germany and still furnishes valuable material to those engaged in musical research. A supplementary edition was subsequently published under the title *Neues Historisch-biographisches Lexikon der Tonkünstler* (4 vols., 1812-14). Gerber's extensive collection of books and musical manuscripts was purchased by the Gesellschaft der Musikfreunde of Vienna and furnished the nucleus of the large library afterwards formed by that society.

GERBER, JOHANN GOTTFRIED HEINRICH (1832-). A German engineer. He was born at Hof, Bavaria, and was educated at Nuremberg and Munich. He built the bridge across the Isar at Grosshesselohe, and designed many large bridges in South Germany. The so-called 'cantilever system,' the germ of which may be seen in the labors of Pope, Canfield, and others, was patented by him under the name of "Träger mit freischwebenden Stützen," and first practically applied by him at Regnitz. The publications of Gerber include: *Die Rheinbrücke bei Mainz* (1863); *Die Isarbrücke bei Grosshesselohe* (1859); and *Träger mit freiliegenden Stützpunkten* (1870).

GERBER, KARL FRIEDRICH WILHELM VON (1823-91). A German jurist and statesman, born at Ebeleben, and educated at Leipzig and Heidelberg. He assisted in the codification of the German commercial and marine laws, and in 1871 became the successor of Falkenstein as Minister of Education in Saxony. In 1891 he was appointed president of the Saxon Ministry. New laws on education were enacted during his administration, and the relation between the Catholic Church and the State was more clearly defined. His *System des deutschen Privatrechts* (17th ed. 1895) is considered the standard authority on that subject.

GERBERT, zhär'bär'. See SYLVESTER.

GERBERT, gër'bärt, MARTIN, Baron von Hornau (1720-93). A Roman Catholic prelate and

writer on Church music. He was born at Horb on the Neckar, and received his education chiefly at the Jesuit School of Freiburg in Bresgau. He joined the Order of the Benedictines in the Monastery of Saint-Blaise in 1737, became priest in 1744, was soon thereafter appointed professor of theology, and was chosen abbot in 1764. From 1759 to 1762 he traveled in Germany, Italy, and France, chiefly with a view of obtaining access to the old collections of musical literature contained in the libraries of the monasteries. In 1774 he published at Saint-Blaise *De Cantu et Musica Sacra*; in 1777, *Monumenta Veteris Liturgiæ Alemannicæ*, four parts; and in 1784, in three volumes, *Scriptores Ecclesiastici de Musica Sacra*, a collection of the principal writers on Church music from the third century till the invention of printing. This work has been of very great importance for the history of music, by preserving writings which otherwise might either have perished or remained unknown. He is also the author of *Codex Epistolaris Rudolphi I.* (1772) and *Historia Nigræ Silvæ Ordinis Sancti Benedicti* (1783-88). He died at Saint-Blaise May 3, 1793.

GERBI, jër'bi, **GERBA**, jër'bä. See JERBA.

GERBIL, jër'bíl (from Fr. *gerbille*, from Neo-Lat. *Gerbillus*, diminutive of *gerbua*, variant of *jerboa*, from Ar. *yarbū*, flesh of back and loin). Any of several rat-like rodents inhabiting Africa, Asia, and Southern Russia. About fifty species are known, forming a subfamily, *Gerbillinæ*, of the rat family (*Muridæ*), characterized by tufted tails and long and powerful hind limbs, giving them much the appearance of *jerboas* (q.v.), and enabling them to progress in long leaps, with great rapidity. They live underground, in extensive connected burrows. They are fawn-colored, very lively, emit an offensive odor, and are extraordinarily prolific. Well-known species are the Egyptian gerbil (*Gerbillus Egyptiacus*) and the East Indian gerbil (*Gerbillus Indicus*), which is strictly nocturnal and often colonizes in or near cultivated fields, where it does serious damage to grain crops.

GERBO'A. See JERBOA.

GERFALCON, jër'fä'k'n. See GYRFALCON.

GERHARD, gër'härt, EDUARD (1795-1867). A German archæologist. He was born in Posen, and after studying at Breslau and Berlin, he, in 1816, took up his residence at Breslau. The reputation he acquired by his *Lectiones Apolloniæ*, published in the same year, led soon afterwards to his being appointed professor at the Gymnasium of Posen. On resigning that office in 1819, on account of weakness in the eyes, he traveled in Italy, and in 1822 he took up his residence in Rome, where, with a view of prosecuting his archæological studies, he remained until 1837. In that year he received an appointment as archæologist in the Berlin Museum. In 1844 he became professor in the university and member of the Royal Academy. He died May 12, 1867. During his long stay in Italy he cooperated in Platner's *Beschreibung der Stadt Rom*, and in 1829 was one of the leading spirits in the foundation of the Instituto di Corrispondenza Archeologica, now the Imperial German Archæological Institute, of which he was vice-secretary. Gerhard's great service to archæological study was in the publication of important groups of monu-

ments, and in promoting an orderly classification. Such a worker was much needed at this time, when the excavations at Vulci and elsewhere in Etruria increased so suddenly the mass of early vases and other small objects. For artistic beauty and style Gerhard had little perception; his interest was largely antiquarian, and it is characteristic of him that he was attracted by the Etruscan art, generally of little interest to the artist. His writings are widely scattered in the volumes of the Archaeological Institute, the Berlin Academy, and various periodicals. Many of these are collected in the *Gesammelte academische Abhandlungen und kleine Schriften* (Berlin, 1866-68). Among his larger works are: *Rapporto intorno i vasi Volcenti* (1831); *Antike Bildwerke* (1827-44); *Auserlesene griechische Vasenbilder* (1839-58), still the best single collection of Greek vases; a publication of selected vases from the Berlin collection *Griechische und etruskische Trinkschalen* (1843); *Etruskische und campanische Vasenbilder* (1843); *Apulische Vasen* (1846); *Trinkschalen und Gefässe* (1848-50); *Etruskische Spiegel*, 4 vols. (1843-68), 5th vol. by Klugmann and Körte (1884-97). With Panofka he prepared a catalogue of the Naples Museum in 1828, and in 1836 one of the antiques in the Berlin Museum. Though Gerhard's *Griechische Mythologie* (1854-55) is still valuable, his mythological work, as well as his interpretation of works of art, suffers from his overestimate of the importance of the mysteries and their symbolism. Consult Jahn, *Eduard Gerhard, ein Lebensabriss* (Berlin, 1868).

GERHARD, JOHANN (1582-1637). One of the ablest and most learned German exponents of Lutheran orthodoxy. He was born at Quedlinburg, October 17, 1582. In his fifteenth year he came under the personal influence of Johann Arndt (q.v.), author of *Das wahre Christentum*, and resolved to study for the Church. Soon after entering the University of Wittenberg (1599) he began to waver in this determination, and ultimately interested himself for two years in the study of medicine, but in 1603 resumed his theological studies at Jena, and in the following year received a new impulse from Winkelmann and Mentzer, at Marburg. Having graduated and commenced lecturing at Jena in 1605, he in 1606 received and accepted the Duke of Coburg's invitation to the superintendency of Heldburg and mastership of the gymnasium; soon afterwards he became general superintendent of the duchy, in which capacity he was much and usefully engaged in the practical work of ecclesiastical organization until 1616, when he found a more congenial sphere in the senior theological chair at Jena, where the remainder of his life was spent and where he died, August 17, 1637. His most famous works are: *Loci Communes Theologici* (1610-22), and his *Sacred Meditations* (1606), which have been translated into several languages. His life was written in Latin by Fischer (Leipzig, 1723), and in German by Boettcher (Dresden, 1858).

GERHARDT, gér'hárt, DAGOBERT VON (pen-name 'Gerhard von Amyntor') (1831—). A German soldier, poet, and novelist, born at Liegnitz. After attending the university he entered the Prussian Army, and advanced to the rank of major. He was severely wounded in the assault upon the fortifications of Düppel during the

Danish War of 1864, and in 1867 was employed by Moltke on the General Staff at Berlin. He served in the Franco-German War, 1870-71. He has become known chiefly through his numerous novels, such as *Der neue Romanzero* (2d ed. 1883); *Eine moderne Abendgesellschaft*, treating of the Jewish question (3d ed. 1881); *Gerke Sutcliffe* (3d ed. 1890); *Durch Nacht zum Licht* (1887); *Die Cis Moll Sonate* (1891). His earlier works include the *Hypochondrische Plaudereien* (4th ed. 1875, new series; 3d ed. 1890).

GERHARDT, EDUARD (1813-88). A German architectural painter, born at Erfurt. He studied architecture in Cologne, and under Semper in Dresden, but in 1838 took up painting at Munich. A series of fine views of Cologne Cathedral attracted the attention of Frederick William IV. of Prussia, whose assistance enabled Gerhard to continue his studies (1848) in Italy, Spain, and Portugal. Summoned afterwards to Lisbon to instruct the princes of the royal family, he returned in 1851, and settled in Munich. He excelled in depicting Moorish architecture, his oil paintings and water colors being of equal merit, as may be judged by "The Palace of the Inquisition at Cordova" (1857); "Lion Court in the Alhambra" (1861); "Interior of Saint Mark's, Venice" (1864), all in the New Pinakothek, and by "The Alhambra by Moonlight," "The Generalife," "The Comares Tower," and two views in Venice, all in the Schack Gallery, Munich.

GERHARDT, KARL FRIEDRICH (1816-56). An eminent French chemist, born at Strassburg. At the age of fifteen he was sent to the Polytechnic School at Carlsruhe, where his attendance at Walchner's lectures first awakened in his mind a taste for chemistry. After two years he removed to Leipzig, where he attended the lectures of Erdmann, which seem to have developed in him a passion for questions of speculative chemistry. On his return home he reluctantly entered upon the business of his father, who was a manufacturer of chemical products, but in his twentieth year he enlisted in a regiment of chasseurs. He soon, however, found military life as insupportable as a commercial career. He therefore purchased his discharge and set out for the laboratory of Giessen, where he worked under Liebig's superintendence for eighteen months. In 1838 he arrived in Paris, and there was cordially welcomed by Dumas. In the laboratory of the Jardin des Plantes he soon commenced, jointly with Cahours, his important researches on the essential oils. In 1844 he was appointed professor of general chemistry in the faculty of sciences at Montpellier. About this time he published his *Précis de chimie organique*. In 1848 he resigned his chair and returned to Paris, in order to follow out uninterruptedly his special investigations, and in that city he established, between the years 1849 and 1855, in successive memoirs, his views of series and his theory of types. It was there, also, that he gave to the scientific world his researches upon the anhydrous acids and the oxides. In 1855 he was made professor of chemistry at Strassburg and corresponding member of the Academy of Sciences of Paris. All his ideas and his discoveries are embodied in his *Traité de chimie organique* (4 vols., 1853-56). He had hardly completed the correction of the last proof of this great work,

when, after an illness of only two days, he died at the very period when he seemed to be beginning to enjoy the fruits of his labor. See *CHEMISTRY*; *AVOGADRO'S RULE*.

GERHARDT, PAULUS, or **PAUL** (1607-76). After Luther, the greatest of German hymn-writers. He was born in Saxony, studied at Wittenberg, and became pastor at Mittenwalde. In 1657 he removed to Berlin, and in 1669 to Lübben, Saxony, where he died in 1676. He was an active supporter of the Lutherans in their controversies with the Reformed churches. Among his most familiar hymns are "O sacred head once wounded" (English by J. W. Alexander); "Commit thou all thy griefs;" and "Jesus, Thy boundless love to me" (English by John Wesley). Consult the critical editions of his hymns by Bachmann (Berlin, 1866), and Goedeke (Leipzig, 1877); his life by Langbecker (Berlin, 1841); Kelly, *Gerhardt's Spiritual Songs* (London, 1867). The first collection of his hymns appeared in 1667.

GERHARDUS MAGNUS. See *GROOTE*.

GERHART, EMANUEL VOGEL (1817—). An American minister of the German Reformed Church. He was born at Freeburg, Pa., and was educated at Marshall College and at the Mercersburg Theological Seminary. After acting as president of Heidelberg College, he occupied for some time the chair of theology in the Theological Seminary at Tiffin, Ohio, whence he was called to the presidency of Franklin and Marshall College in 1855, where he also lectured on mental and moral philosophy. In 1868 he was appointed professor of philosophy at the Reformed Church Seminary, Lancaster, Pa. He edited Rauch's *Inner Life*; his original publications include *Philosophy and Logic* (1858).

GERHOH, gër'hô, or **GERHOCH VON REICHERSBERG**, gër'hók fôn rik'ërs-bërk (1093-1169). A German theologian, born at Polling, near Weilheim, Bavaria. In 1132 he was appointed by Archbishop Conrad to the chief jurisdiction of the canonry of Reichersberg, in which position he became conspicuous as a reformer of the institution. In his work *De Investigatione Antichristi* he severely criticises the ecclesiastical conditions of his time. The work is historically valuable also in its bearing upon the Second Crusade. Gerhoh's "Commentary on the Psalms" was published in the *Thesaurus Anecdotorum* (1728).

GERI (gä'rè) **AND FREKI**, frä'kè. The wolves of Odin (q.v.). They lie at his feet as he is seated on his throne in Valhalla, ready to feast with his chosen heroes. Odin himself needs no food, so he gives all the meat that is set before him to his wolves.

GÉRICHAULT, zhä'rè'kô', JEAN-LOUIS ANDRÉ THÉODORE (1791-1824). A French painter, the leader of the Romantic School in its revolt against the tyranny of Classicism of David. His temperament was too vivid and sympathetic to tolerate the formal and conventional. The realities of his time appealed to him too intensely to permit his mind to rest upon the unrealities of the Classical School. As a realist, however, the scope of Géricault is limited.

Géricault was born at Rouen September 26, 1791. The family moved to Paris soon afterwards, and the boy entered the Lyceum Louis-

le-Grand. He left this school in 1808. He first entered the atelier of Carle Vernet (q.v.), and in 1810 he went over to the atelier of Guérin, but there was never any artistic sympathy between master and pupil. Much of his time was spent in Versailles, where he found the stables of the palace open to him, and where he gained his knowledge of the anatomy and action of horses.

At the Salon of 1812 Géricault exhibited one of the best known of his pictures, "A Cavalry Officer on Horseback." His "Wounded Cuirassier" was exhibited in the Salon of 1814, but was not especially successful. Géricault in a fit of disappointment entered the army and served for a time in the garrison of Versailles. In 1816 he went to Italy, and, after a month in Florence, settled in Rome for two years. The work of the Italian masters affected him powerfully, that of Michelangelo appealing especially to his temperament. The productions of this period are perhaps the most vigorous of his entire career. They are mainly in the form of drawings, of which many have been preserved. The finest of these are a series of studies for a picture which he intended to paint of the horse-race in the Corso during Carnival. The painting called the "Raft of Medusa," now in the Louvre, has come to be deemed one of the most powerful productions of the French School. At the exhibition of 1819, however, it was placed too high, and was received very coldly. Géricault carried the picture to England, where he exhibited it at a shilling admission, realizing 17,000 francs. During his stay in England Géricault associated much with Charlet, the lithographer and caricaturist. There are many of his powerful plates in collections throughout Europe. Géricault modeled frequently. Some bronzes and wax sketches by him are in existence, the finest of them being an anatomical study of a horse.

Soon after his return to Paris in 1822 Géricault was injured by a fall from a horse, and spent the rest of his life in extreme distress. He died in Paris January 26, 1824. Consult: Clément, *Géricault: Etude biographique et critique* (Paris, 1868); Brownell, *French Art Classic and Contemporary* (New York, 1901).

GERICKE, gä'rik-ë, WILHELM (1845—). A German orchestral conductor. He was born at Gratz, Austria, and early gave evidence of a strong musical temperament. In 1862 he entered the Vienna Conservatory, where he studied under Dessoff. Leaving the conservatory in 1865, he became kapellmeister of the theatre at Linz, and in 1874 received the appointment of second kapellmeister of the Vienna Court Opera, of which Hans Richter (q.v.) was first kapellmeister. On the retirement of Brahms from the conductorship of the Gesellschaftsconcerte in 1880, Gericke succeeded him, and became also the conductor of the Singverein. His fame as a conductor, and particularly as a drill-master, induced the Boston (Mass.) Symphony Orchestra to secure him as its leader. From 1884 to 1889 he held the baton of the organization and succeeded in placing it in the front rank of the world's great orchestras. In 1889 he returned to Vienna, and to the leadership of the Gesellschaftsconcerte (Nikisch succeeding him in Boston), but resigned again in 1895. Three years later he once more took charge of the Boston Orchestra, succeeding Emil Paur. He has published many works for the

orchestra, besides much pianoforte and chamber music; but it is principally through his artistic interpretations, skillful leading, and painstaking drill that he has attained his high rank as conductor.

GERING, gä'ring, ULRICH (c.1440-1510). A Swiss printer. He was one of the printers called by Guillaume Fichet, then rector of the Sorbonne, to put up the first printing-press ever used in France. In this he was assisted by Michel Friburger and Martin Crantz.

GERIZIM, gër'î-zim. See EBAL AND GERIZIM.

GERLACH, gër'låg, ERNST LUDWIG VON (1795-1877). A Prussian statesman, born in Berlin. He became one of the leaders of the Prussian High-Church Party, and was president of the Magdeburg Superior Court from 1844 to 1874. In 1849 he founded the *Neue Preussische Zeitung*, in which he freely expressed his ultra-conservative views. In 1858 he retired from the leadership of his party. He published a pamphlet, *Die Annexionen und der norddeutsche Bund* (1866), denouncing the annexations of 1866 and the exclusion of Austria from the German Bund.

GERLACH, FRANZ DOROTHEUS (1793-1876). A Swiss historian and philologist, born at Wolfshagen, near Gotha, and educated at Göttingen. He was professor at the University of Basel from 1820 until shortly before his death, and during the greater part of that time also occupied the position of chief librarian at that institution. He was distinguished chiefly for his pedagogical ability. His works include a German translation of Livy (1856-73), with an introductory volume entitled, *Die Geschichtschreiber der Römer von den frühesten Zeiten bis auf Orosius* (1855); and editions of Tacitus's *Germania* (1835); Sallust (1823-31); *Lucilius* (1846); and *Nonius Marcellus* (1842).

GERLACH, OTTO VON (1801-49). A German theologian. He was born in Berlin; studied law at Heidelberg and Göttingen, and theology at Berlin, preached for a time in the latter city, and became Court chaplain in 1847. Together with his brothers, Ludwig von Gerlach and Gen. Leopold von Gerlach, he was an upholder of orthodoxy in Prussia. He wrote a commentary on the Bible.

GERLACH, THEODOR (1861-). A German composer, born at Dresden, and for a time the pupil of Fr. Wüllner, and a student of the University of Berlin. His cantata, *Luthers Lob der Musica*, first given in Italy, in 1884, drew on him the attention of the musical world, and paved the way for the success which followed. In 1885 he became kapellmeister of the Sondershausen Theatre, and a year later of the German Opera in Posen. The success which greeted his *Epic Symphony* gained for him the appointment of Hofkapellmeister at Coburg in 1891, followed three years later by his appointment as kapellmeister at Cassel. He is a remarkably prolific as well as successful composer, his works embracing every branch of musical composition. He wrote both music and text of a three-act opera, *Matteo Falcone* (1898), which was received with great favor upon its production in Hanover.

GERLACHE, zhär'lash', ETIENNE CONSTANTIN, Baron de (1785-1871). A Belgian states-

man and historian, born in Luxemburg. In 1824 he was elected as Deputy from the Province of Liège to the Second Chamber of the States General. Together with the most enlightened of the Belgians he advocated separation from Holland. At the time of the Revolution, as president of the committee appointed to revise the Constitution, he advocated complete political and religious liberty, and hence opposed the Duc de Nemours on the ground that the latter's election was a sort of annexation to France. He was head of the deputation sent to offer the crown to Prince Leopold of Saxe-Coburg. In 1831 he became president of the Chamber of Representatives, and in that capacity received the oath exacted from the King by the Constitution, and the following year was appointed first president of the Court of Cassation, which position he held until 1867. In 1843 the King conferred on him the title of Baron. After his election as Deputy in 1824, he supported the Catholic Party, and was regarded as one of their chief leaders. Gerlach was also widely known as a writer. His *Histoire du royaume des Pays-Bas, depuis 1814 jusqu'en 1830* (1839), is a severe attack upon the Dutch Government. Besides some works on contemporaneous history, he published *Salluste et quelques-uns des principaux historiens de l'antiquité considérés comme politiques, comme écrivains et comme moralistes* (1859). His collected works were published in six volumes in 1875.

GERLAND, gër'lânt, GEORG KARL CORNELIUS (1833-). A German geographer and ethnologist. He was born at Cassel, and was educated at Marburg and Berlin. In 1875 he was appointed professor of geography and ethnology at Strassburg. His principal works relate to anthropology, and include: *Ueber das Aussterben der Naturvölker* (1868); *Atlas der Ethnographie* (1876); *Die Zukunft der Indianer* (in the *Globus*, 1879); and "Atlas der Völkerkunde," in Berghaus, *Physikalischer Atlas* (7th part, 1891-92).

GERM. See BACTERIA; DISEASE, GERM THEORY OF.

GERMAIN, jër-män', GEORGE SACKVILLE, Viscount SACKVILLE (1716-85). An English soldier and politician. He was born in England and accompanied his father, the Duke of Dorset, to Dublin on his appointment as Lord Lieutenant of Ireland in 1731. Sackville, as he was called up to 1770, was educated at Trinity College, Dublin, and in 1737 was commissioned a captain in the Sixth Dragoon Guards. Promoted lieutenant-colonel of the Twenty-eighth Foot, he served with his regiment under Cumberland in Flanders, being wounded at Fontenoy in May, 1745. He was made a colonel in 1746. During his father's second term as Lord Lieutenant of Ireland (1751-56) Sackville acted as his principal secretary, and as Secretary of War for Ireland. In 1758 he took part in the expedition to Saint-Malo (France), and in the same year accompanied the third Duke of Marlborough as second in command of the English troops sent to Hanover to aid Prince Ferdinand of Brunswick in his operations against the French. Sackville succeeded to the command of the British contingent after the death of Marlborough, but for his refusal to obey Ferdinand's orders at the victorious battle of Minden (August, 1759), he was

dismissed from the army. Charges of cowardice were brought against him, which at a court-martial, held in 1760, were not proved, but his dismissal was approved on the ground of insubordination, he was declared unfit for military command, and was dismissed from the Privy Council by George II. Sackville's political career had begun in 1741, in which year he was elected to represent Dover in Parliament, and he had continued as a member of the House from some constituency ever since. Shortly after George III. became King his name was restored to the list of privy counselors, and he began to take an active part in the debates in Commons as a supporter of Lord North. The first actual mark of favor shown him was his appointment as Vice-Treasurer of Ireland, a position he held during 1765-66. In 1769 he was declared by some, without much reason, to be the author of the *Junius Letters*. He assumed the name of Germain in 1770. From 1775 to 1779 he was a lord commissioner of trade and plantations, and at the same time Secretary of State for the Colonies, which position he held until the resignation of Lord North in 1782. In this latter position, in which he had in charge the actual conduct of the war in America, he did much to inbitter the Americans against the mother country by his advocacy of harsh measures, by the employment of Continental mercenaries and Indians, and by his continued opposition to all propositions looking toward peace. After the fall of the North Ministry he was created Viscount Sackville and retired from public life.

GERMAN, J. EDWARD (1862—). An English orchestral composer. He was born at Whitchurch in Shropshire, and after preliminary instruction under local teachers, became a student at the Royal Academy of Music, where he studied from 1880 until his graduation in 1887 as an associate, the fellow's degree being granted him in 1895. In 1889 he became director of music at the Globe Theatre, London. Although he is the composer of an operetta, *The Rival Poets* (1886), several symphonies, and considerable chamber music, it is through his incidental music to several of Shakespeare's plays, as *Richard III.*, *The Tempest*, *Romeo and Juliet*, *As You Like It*, and *Henry VIII.*, that he has become well known. The three dances from the music to the last-named play are popular throughout the world, and particularly in the United States.

GERMAN BAPTIST BRETHERN, THE. A considerable body of Christians, also known as Dunkers, and among themselves as Brethren, whose faith and practice are not generally known outside of the localities in which they live. Thus the reiterated statements that they are celibates, that they discourage marriage, that they do not marry outside of their own fraternity, that they keep the seventh day as the Sabbath, that they live in communities, and other similar errors set forth in the books, always have been without foundation. The movement which resulted in the closer organization of the German Baptist Brethren grew out of the great religious awakening which occurred in Germany in the latter part of the seventeenth century, when large numbers, becoming dissatisfied with the lack of spirituality in the State Church, withdrew from its communion. They organized at Schwartzau, Germany, in 1708, with Alexander Mack as their

first minister; but in no way do they regard him as the founder of the Church.

Driven by persecution to Wittgenstein, they rejected all human creeds, and accepted the Gospel of Jesus Christ as their rule of faith and practice. The Church suffered from persecution, and finally emigrated (1719-29) to America, settling near Germantown, Pa., where the first church in this country was organized in 1723. Among the early emigrants was Christopher Saur, who was the first in America to print the Bible in a European tongue. From this nucleus the Church spread southward and westward, and flourishing congregations are now to be found in most of the States. They are, however, most numerous in Pennsylvania, Maryland, Virginia, Ohio, Indiana, Illinois, Iowa, Missouri, Nebraska, Kansas, and North Dakota. At the annual conference held at Lincoln, Neb., in 1901, twenty-five States and five foreign countries were represented. They now number about 100,000 communicants, have 720 congregations, with 2600 ministers, who, as a rule, serve without salary. They are largely engaged in agricultural pursuits. Seven colleges receive a fair support. These are located at Bridgewater, Va.; Uniontown, Md.; Elizabethtown and Huntingdon, Pa.; North Manchester, Ind.; Mount Morris, Ill.; and McPherson, Kan. Missions have been established in Denmark, Sweden, France, Switzerland, Asia Minor, and India. The Missionary Society has an endowment fund exceeding a quarter of a million dollars. A large and well-appointed publishing house, located at Elgin, Ill., is owned by the Church. The *Gospel Messenger*, the Church paper, has a circulation of over 20,000, and other publications enjoy a large patronage.

In doctrine the Brethren are strictly orthodox. They hold the Bible to be the inspired and infallible word of God, and accept the New Testament as their only rule of faith and practice. They believe in the Trinity, in the divinity of Christ and of the Holy Ghost, and in future rewards and punishments. In the subtleties of speculative theology they take but little interest. Faith, repentance, and baptism are held to be the conditions of salvation. These three constitute true evangelical conversion, and upon them rests the promise of the forgiveness of sins and the gift of the Holy Ghost. In practice they follow closely the Scripture teaching, and observe the primitive simplicity of the Apostolic Church; hence they regard nonconformity to the world as an important principle. They enjoin plainness of dress, settle their difficulties among themselves without going to law, affirm instead of taking oath, refrain from taking a prominent part in politics, are opposed to secret societies, advise against the use of tobacco, and have a rule more than a century old against the manufacture, sale, and use of intoxicants. As early as 1782 they prohibited slavery, and pronounced in strong terms against the slave trade. They baptize believers only, dipping them face forward at the mention of each name in the Trinity given in the baptismal formula in Matt. xxviii. 19. Communion is observed in the evening, after a full meal called the Lord's Supper. Before the supper the ordinance of foot-washing is observed, the brethren washing one another's feet, and the sisters performing the same service among themselves. After supper, before the communion is taken, the sexes extend the right hand of fellow-

ship and exchange the kiss of peace. Bishops, or elders, ministers in the first and second degree, and deacons, are elected by the congregations. Ministers are advanced from the first to the second degree, and bishops are chosen from the latter, and ordained by the imposition of hands. Congregations are organized into State districts, and both elect delegates to the annual conference, which is the chief ecclesiastical body. Here the fullest and freest discussion of all questions coming before the assembly is permitted. The final decisions are rendered by a two-thirds vote of the delegated body, and are binding on all the churches. Women are eligible to serve as delegates in conference.

In 1881-83 the Church suffered the loss of about 8000 communicants by a division in its ranks, resulting in the secession of two parties, known as the Old-Order and Progressive Brethren. The former objected most seriously to the advance the Church was making in educational, missionary, and Sunday-school work, while the latter insisted strenuously that the Church was too conservative, that the rules laid down by the annual conference were oppressive, and that greater liberty should be enjoyed in matters of dress. After some years of contention, these parties withdrew from the mother Church and formed separate organizations. The Old-Order Brethren now number about 4000. They determinedly oppose higher education, missionary work, Sunday schools, and revival services. They publish a paper, the *Vindicator*, which has a small circulation. In 1890 the Progressive Brethren numbered 8000, and have since then increased, claiming 13,000 in 1900. They have a college at Ashland, Ohio, where their publishing house is also located. The *Evangelist*, their Church paper, circulates generally among the members of their body. For the German Seventh-Day Baptists, an early offshoot of the German Baptist Brethren, see BAPTISTS.

GERMAN BAPTISTS. See BAPTISTS.

GERMAN CATHOLICS. The name given to a sect which originated in Germany in 1844, and had a short existence. In that year Johannes Czerski (q.v.) undertook to found the 'Christian-Apostolic Catholic Congregation,' at Schneidemühl, in Posen. The confession of faith drawn up by Czerski rejected certain doctrines and practices of the Roman Catholic Church, but retained the Nicene Creed, the seven sacraments, and prayer for the dead; it declared the Bible the only sure source of Christian faith. About the same time Johannes Ronge (q.v.) uttered his protest against the exhibition of the holy coat (q.v.) at Treves, and the following year was called to take charge of a large 'German Catholic' congregation at Breslau. Ronge's confession of faith was far more radical than that of Czerski, and had a decided rationalistic tendency. The movement spread with remarkable rapidity, and many similar congregations were formed. In March, 1845, a conference was held at Leipzig and an organization effected. Among the prominent members of this gathering was Robert Blum (q.v.). The movement was forbidden in Austria and Bavaria. By the end of 1846 there were 60,000 German Catholics, more than half of them in Silesia. A second council was held at Berlin in 1847, at which liberal and rationalistic tendencies were still more marked. The decline of the associa-

tion was due to two causes—the active part which many of its members took in politics, and the continual controversy between the adherents to the rationalistic confession of Ronge and those who preferred the more evangelical one of Czerski. After the Revolution of 1848 it rapidly went to pieces. In 1850 it was united with the Free Congregations (q.v.). In 1863 Ronge and Czerski attempted to revive the movement by the 'Religious Reform Union.' It is now practically dead. Consult: Günther, *Bibliothek der Bekenntnisschriften der deutschkatholischen Kirchen* (Jena, 1845); Bauer, *Geschichte der Gründung und Fortbildung der deutschkatholischen Kirche* (Meissen, 1855); Kampe, *Wesen des Deutsch-katholicismus* (Tübingen, 1850); id., *Geschichte der religiösen Bewegung der neuern Zeit* (Leipzig, 1852-60).

GERMANDER (from Fr. *germandrée*, Sp. *camedris*, *camedreo*, from Lat. *chamædrys*, wall-germander, from Gk. *χαμαῖδρως*, *chamaidrys*, germander, from *χαμαί*, *chamai*, on the ground + *δρῦς*, *drys*, oak), *Teucrium*. A genus of numerous and widely distributed species of plants of the order Labiata. The common germander, or wall-germander (*Teucrium chamædrys*), often found on ruined walls in Great Britain, has probably been introduced from the south of Europe. It is a small, almost shrubby perennial, with wedge-shaped ovate, serrate leaves, and whorls of large reddish-purple flowers. It is bitter, somewhat aromatic, and was formerly much used in medicine, particularly as a principal ingredient in a once famous gout medicine called Portland powder. Similar medicinal virtues were ascribed to *Teucrium botrys*, a small annual species common on dry hills in Germany, having aromatic fragrance and yellow flowers. Cat-thyme (*Teucrium marum*), a native of the south of Europe, abounds in a pungent volatile oil, has a camphor-like smell, and, like catmint and valerian-root, is greatly relished by cats. It is often used as a sternutatory. Two species are rather abundant in the United States—wood-sage, or American germander (*Teucrium Canadense*), in low ground in the eastern part of the United States, and *Teucrium occidentale* in the West.

GERMAN EAST AFRICA. The largest and most important colonial possession of Germany. It lies on the east coast of Africa, extending from latitude 1° to about 11° 40' S., and from about longitude 29° to 40° 40' E., with a coastline of 620 miles. It is bounded on the north by British East Africa, on the east by the Indian Ocean, on the south by Portuguese East Africa and British Central Africa, on the southwest by Rhodesia, and on the west by the Congo Free State. A part of the western boundary extends north and south through the middle of Lake Tanganyika; another part of it is washed by the northeastern portion of Lake Nyassa: the northern boundary crosses Victoria Nyanza in latitude 1° S. The area is estimated at 364,000 square miles—almost double the size of Germany. The small island of Mafia, off the coast, also belongs to the colony.

TOPOGRAPHY AND HYDROGRAPHY. The coastal region is a narrow, low plain formed by sedimentary strata and coral limestone. Behind the coastal, jungle-covered plain rises a wide plateau, extending to Tanganyika, from 3000 to

4000 feet in height. It is surmounted in the east by the hills and mountains of Usambara, Useguha, Usagara, and other districts, which extend south to the Rufiji River and inland about 300 miles. This mountain region, some of whose peaks are 6000 feet high, is in great part well watered, well wooded, and fruitful, and its drainage reaches the Indian Ocean through the Pangani, Rufu, Wami, and Rufiji rivers. West of the mountains is a wide steppe region, dry and poverty-stricken, for the mountains between it and the Indian Ocean keep most of the rain-clouds in the east. The thirsty steppe merges gradually into the high fertile plain of Unyamwesi, south of Victoria Nyanza. On the western border of the colony the plateau is broken by the cleft of the Great Rift Valley (q.v.), and also by vertical displacements which have raised the strata west and north of Lake Nyassa into mountains of considerable elevation, some peaks of the Livingstone Mountains reaching 6000 to 9000 feet. The lofty volcanic mass of the Mfumbiro Mountains lies on the northwestern boundary. In the north the plateau is intersected by other rifts, and has been the seat of volcanic activity. Mount Kilimanjaro, an isolated volcanic peak, rising to a height of 19,720 feet, is the culminating point of Africa.

The coast and the bordering mountain region are watered mainly by the rivers Rufu, Pangani, Mgeta, Rufiji, and Rovuma and their tributaries. The interior, which has few perennial streams, is drained into lakes Tanganyika and Victoria Nyanza, and thence into the Congo and the Nile, a few rivers also reaching the Zambezi through Lake Nyassa. None of the rivers is of any importance for navigation, except for stretches here and there where small boats carry produce. There are numerous small lakes in the northern part of the country.

CLIMATE. The climate is tropical and unhealthy; malaria prevails, the mountain regions alone offering a few districts, like western Usambara, that are free from it. On the coast there are two rainy seasons, from the middle of March to the end of May, and from the middle of October to the middle of December; in the interior there is only one rainy season, from November to the end of April. The rainy season is the hottest of the year. The mean annual temperature is about 78° in the coast land, and considerably above that in some parts of the interior.

GEOLOGY AND MINERAL RESOURCES. The plateau region is mainly composed of ancient crystalline rocks, while the coastal plain consists of later sediments. West of the northern end of Lake Nyassa coal of good quality has been found, and several tons have been carried to the lake on the backs of men. The development of these deposits will await better means of transportation. The natives mine sufficient iron for their uses, and gold has been discovered in the southwest, but no mining is yet carried on by the whites.

AGRICULTURE. Agriculture and cattle-raising are the chief occupations of the settled natives. Millet is grown in most parts of the colony, while wheat, sesame, tobacco, and rice are confined to certain localities. Bananas are cultivated chiefly on the coast. The German Government is furthering agricultural development by establishing experimental stations and plantations among the highlands of the northeast part of the

colony, to which the German plantations are still almost wholly confined. Nearly all European vegetables thrive in some of these high districts. Hundreds of thousands of coffee-shrubs have been reared on the German plantations; the crop thrives and exports are increasing. The tobacco crop is rapidly increasing, but it is of poor quality, and is only sold to the natives and Arabs. Cotton has not succeeded, but sugar and copra are important. The collecting of india-rubber makes steady progress. The commerce of the colony is chiefly in the hands of German firms. The chief exports are rubber, cereals, and coffee, while the imports consist mostly of provisions, textiles, hardware and iron, and rice. The total trade of the colony for 1900 amounted to somewhat less than \$3,750,000, of which the exports amounted to a little over one-third. The trade is largely with Zanzibar, British India, and Germany, and passes chiefly through the ports of Dar-es-Salaam, Bagamoyo, Pangani, Kilwa, Lindi, Mikindani, and Tanga. In 1899 there were in the colony over 100 trading and industrial companies, not including numerous small Indian concerns. The colony has regular steam communication with Germany and Bombay. The three boundary lakes are navigable by steamers. The main roads are generally good, the Government having constructed over 1000 miles of roads for wheeled traffic. The Usambara Railway line was completed in 1901 for about 45 miles. It has been in operation from Tanga to Muheso since 1895, and is being extended through Usambara to Korogwe. The chief ports are connected by telegraph with Zanzibar.

At the head of the colony is the Governor, appointed by the Emperor. The whole colony is divided into eight districts and fourteen stations, the former administered by distinct officers and councils. The German army of occupation numbers over 1700 men, of whom over 1500 are colored. There are Government schools at Dar-es-Salaam, Tanga, and Bagamoyo. The revenue of the colony is derived chiefly from import duties and a hut tax, and covers only a small portion of the expenditures. Thus, in the budget for 1901 the latter are estimated at \$2,927,400, including over \$1,000,000 for railway construction and about \$550,000 for the colonial army. The revenue for the same year is given as \$770,000, necessitating an Imperial subvention of over \$2,000,000.

According to an enumeration of 1900, the colony had a population of over 6,100,000, including 1139 Europeans (872 Germans). The natives are of the Bantu race, but there is also a strong Asiatic element on the coast. The seat of government is Dar-es-Salaam (q.v.).

HISTORY. German colonization on the east coast of Africa began in 1884, when an expedition sent by the German Colonization Society (established in the same year) secured by treaty the territories of Useguha, Nguru, Usagara, and Ukami. In 1885 the German East African Company came into existence, and during 1885-86 succeeded in extending its dominions along the coast from Somaliland to the mouth of the Rovuma, with the exception of the territory around Mombasa, then in the possession of the British. By the Anglo-German agreement of 1886 the northern boundary of the colony was fixed, and the dominions of the Sultan of Zanzibar on the mainland reduced to a narrow strip

along the coast. The southern boundary of the colony was fixed in 1887. In the following year an agreement was reached with the Sultan of Zanzibar by which the latter ceded his possessions on the mainland to the company for an annual rental. An outbreak of the Arabs on the coast prevented the agreement from going into effect, and as the German forces then present in the colony were insufficient to cope with the rebels, the latter soon made themselves masters of all the seacoast towns, with the exception of Dar-es-Salaam and Bagamoyo. At the beginning of 1889 the company appealed to the German Government, and a military force of 800 colored troops, under the command of German officers, was dispatched to the colony. The rebellion was suppressed within a year. By a second agreement with Great Britain, in 1890, the Territory of Vitu, then within the German sphere of influence, was exchanged for Helgoland (q.v.), in the North Sea. The Sultan of Zanzibar renounced his claim to the coast for the sum of 4,000,000 marks (\$952,000), and on January 1, 1891, the colony came under the control of the German Government. Consult: Reichard, *Deutsch-Ostafrika* (Leipzig, 1898); Peters, *Das Deutsch-ostafrikanische Schutzgebiet* (Munich and Leipzig, 1895); Baumann, *Durch Massailand zur Nilquelle* (Berlin, 1894); Stuhlmann, *Mit Emin Pascha ins Herz von Afrika* (Berlin, 1894).

GERMAN EMPIRE. See GERMANY.

GERMAN EVANGELICAL PROTESTANT CHURCH. The name given collectively to a number of independent German churches in the United States, mostly west of the Alleghany Mountains. No general organization of these churches has been instituted; but a union of ministers has been formed, which is called 'The German Evangelical Protestant Ministers' Association of North America.' This body is of comparatively recent origin, although some of the churches whose ministers are affiliated with it are old. It is founded on the basis of the principles of the United Church of Prussia of 1817. Its purposes, as set forth in its published organs, are to furnish a worthy representation of the German Evangelical Protestant Church in North America; to promote the association of the ministers, for mutual assistance, advancement in knowledge, and greater practical efficiency for their work and for the benefit of their congregations; and to secure the preservation of the independence, while promoting the connection, of the German Evangelical Protestant congregations and ministers. The doctrinal principle of the union is the Gospel of the Lord Jesus Christ, the interpretation of which is left to the judgment of the believer, enlightened by the Christian idea. The Association is composed of three district associations—those of Cincinnati, of Pittsburg, and the Western District Association—and is under the management of a central board, or *Behörde*, consisting of a president, a treasurer, a secretary, and three trustees. The congregations have no part in it. It maintains an orphans' home and a home for the aged, near Pittsburg; aids in the support of the Protestant orphans' homes in Cincinnati and Saint Louis; and assists other benevolent institutions when required. Preparations are making for the establishment of a ministers' seminary at New Bremen, Ohio. The periodical organ of

the Association, the *Kirchenzeitung*, is published weekly at Cincinnati and monthly at Pittsburg. A periodical for youth, the *Christlicher Jugendfreund*, is published semi-monthly. The book list of the publishing house at Cincinnati comprises a small number of books of elementary religious instruction, devotional books, and the *Protestantischer Volkskalender*. The present (1902) number of ministers in the Association is about one hundred, some of them having charge of two or more congregations; and the number of members in the congregations is estimated by the secretary of the *Central Behörde* to be about 20,000.

GERMAN EVANGELICAL SYNOD OF NORTH AMERICA, THE.

A Church organized October 15, 1840, when six German ministers doing missionary work in Missouri and Illinois met at Gravois Settlement, Mo., and formed the 'German Evangelical Association of the West.' Most of its early ministers had been ordained in the Evangelical Church of Prussia, some had been sent out by the Basel and other missionary societies, and a large number of the members of their congregations had been attached to the United Evangelical Church in their native land. Other Evangelical unions were organized in other parts of the country, and in time were united with this one; the 'German Evangelical Church Association of Ohio' in 1858, the 'German United Evangelical Synod of the East' in 1860, and the 'Evangelical Synod of the Northwest' and the 'United Evangelical Synod of the East' in 1872. As these unions were effected the name of the Church was changed to 'Evangelical Synod of the West' in 1866, and the 'German Evangelical Synod of North America' in 1877. The doctrinal position of the Church, as defined in the declaration in its constitution (section 2), is that it "considers itself a part of the Holy Christian Church, and as such does acknowledge the Holy Scriptures of the Old and New Testaments as the only true and infallible guide of faith and life, and accepts the interpretation of the Holy Scriptures given in the symbolical books of the Lutheran and Reformed churches in so far as they agree. In all points of difference the Evangelical Church refers to and abides by the words of the Holy Scriptures, availing itself of that liberty of conscience which, as a component part of the basis of man's ultimate responsibility to God Himself, is the inalienable privilege of every believer." The chief governing body is the General Synod, which meets every four years, and is composed of pastoral, lay, and teacher delegates, chosen by the district meetings. The Church is divided into seventeen districts, which have charge of local affairs, with officers responsible to the General Synod or its president. The work of home missions, carried on under supervision of the various district boards and the General Board for Home Missions, and aided by the Church Extension Fund, covers ninety-five fields, and is supported at an annual expenditure of from \$18,000 to \$22,000. The foreign-mission work is under the charge of a separate board, and includes, in the Central Province of India, 4 principal stations, 27 minor stations, 23 schools, and an asylum for lepers, with 4291 Church members and 1137 pupils, and 373 orphans cared for. The mission employs 107 persons, and the expenditure upon it in 1900-01 was \$25,494. The

institutions of learning comprise the *Proseminar*, at Elmhurst, Ill., and Eden Theological Seminary, Saint Louis, Mo., which provide courses of four years for teachers and seven years for theological students. The charitable institutions are: Six orphan homes, five deaconesses' homes, an emigrant mission at Baltimore, Md., provision for superannuated ministers and for widows and orphans of deceased ministers and teachers, hospitals, etc. In 1900-01 the synod had 922 ministers, 1153 congregations, 203,574 communicants, 10,144 teachers and 100,177 scholars in Sunday schools, 486 parochial schools, and aggregate annual contributions for the propagation of the Gospel of about \$95,660. Provision for supplying the Church with its own literature is made at Eden Publishing House, Saint Louis, Mo. Until recently the literature has been all in German. To meet the rapid Anglicization of the children of the Church, the publication of periodicals and the preparation of books in English has been entered upon. Among the books in English already published are a large hymnal, Sunday-school hymns, catechisms, question-books, text-books, and elementary works. The periodicals of the synod are: *Der Friedensbote* (weekly); *Der Deutsche Missionsfreund* (monthly); *Magazin für evangelische Theologie und Kirche* (bi-monthly); *The Messenger of Peace* (monthly); *Evangelical Companion* (monthly); and children's and Sunday-school periodicals—all published at Saint Louis, Mo.

Consult: Schory, *Geschichte der deutschen evangelischen Synode von Nord-Amerika* (Saint Louis, 1889); Behrendt, *Die Heidenmission der deutschen evangelischen Synode von Nord-Amerika* (Saint Louis, 1901); Hermann Baltzer, *Adolf Baltzer, Ein Lebensbild aus der deutschen evangelischen Kirche Nord-Amerikas*; the *Festschrift zur Erinnerung an das goldene Jubiläum des evangelischen Prediger-Seminars, 1850-1890*, has historical value.

GERMANIA. The general name under which the Romans designated a great part of modern Germany, and, in addition, two districts, respectively, in the east and in the extreme north of Gaul, called Germania Superior (or Prima) and Germania Inferior (Secunda). Germany proper was styled Germania Magna, Germania Trans-Rhenana ('beyond the Rhine'), or Germania Barbara. The boundaries of the region comprehended under these designations were the Rhine and Celtic Gaul on the west; on the east, the Vistula and the Carpathian Mountains; on the south, the Danube; and on the north, the sea, which was divided by the Cimbric Chersonesus (Jutland) into the German and the Suevic (Baltic) seas. The first occurrence in connection with the history of the people of Germania with which we are acquainted was the appearance of warlike tribes of Cimbri and Teutones in the present Styria, where they defeated the Roman consul Papirius, in the year B.C. 113. Eleven years later they again came into collision with the Roman arms, but the result was their signal defeat by Marius. The names Germani and Germania do not seem to have been appellations in use among the people themselves, and it is probable that the Romans borrowed them from the Gauls, in whose language the word *gairm*, a loud cry, may possibly have served to designate this people, whose habit it was to accompany

their attack on an enemy by loud cries. The Tungri were the first German people that crossed the Rhine, but other tribes soon followed; and when Julius Cæsar opened his Gallic campaigns, B.C. 58, he found the Germanic nations of the Triboci, Nemetes, and Vangiones in possession of the districts lying between the left bank of the Rhine and the Vosges, while he even encountered a rival pretender to the supremacy of Gaul in the person of Ariovistus, the leader of the Suevic tribe of the Marcomanni. The Germanic peoples west of the Rhine were reduced to subjection with the rest of Gaul, while the Tencteri and Usipetes, who had invaded Belgium, were driven, together with the Sicambri, across the Rhine to their former settlements by the victorious general, who for the first time (B.C. 55) led a Roman army into Trans-Rhenic Germany. The quiet which Cæsar's victories had secured in the Rhenish districts was again so seriously disturbed by the Usipetes and several of the neighboring tribes in the year B.C. 16, that Augustus, who had hastened to Gaul on the outbreak of disturbances, saw that stringent measures must be adopted to keep the Germans in check, and sent Drusus at the head of eight legions into Germany. The first step of the Roman general was to dig a canal ('fossa Drusiana') from the Rhine to the Yssel, by which the Roman galleys could sail from the heart of the continent to the ocean; and so successful were his measures, that in the course of four campaigns he had carried the Roman arms as far as the Albis (Elbe), subdued the Frisii, Batavi, and Chauici in the north, and defeated the Catti of the Menus (Main) districts. Drusus, who died B.C. 9, began the series of forts, bridges, and roads which were completed and extended under succeeding commanders. The attempt made by Varus, under the direction of Augustus, to introduce the Roman provincial forms of administration into Germany, brought, however, a sudden check to the advance and consolidation of Roman power; for the tribes of Central Germany, indignant at this attempted subversion of their national institutions, ranged themselves under the leadership of Arminius, a chief of the Cherusci, who organized a general revolt. The result of this movement was the destruction, in the *Salutis Teutoburgiensis*, in A.D. 9, of the three legions commanded by Varus, and the subsequent loss of all the Roman possessions between the Weser and the Rhine. The news of this disastrous event threw the city of Rome into consternation. Germanicus, who was sent forth in A.D. 14 to restore Roman supremacy, would probably have again wholly subjugated the Germanic tribes had he not been recalled by Tiberius in the midst of his victories. From this time forth the Romans ceased their attempts to conquer Germany, and contented themselves with repelling the incursions which the tribes made on their frontiers, and endeavoring by their influence to foster the intestine disturbances which were perpetually generated through the ambition and jealousy of rival leaders, such as Arminius, Marbadius, and the Goth Catualda. After the murder of Arminius by his own people, the power of the Cherusci declined, while the Longobards and Catti began to assert a recognized preponderance among the neighboring tribes. Occasional encounters took place between the people of Central Germany and the legions who guarded the well-protected Roman boundary-line, which extended from the

Rhine to the Taunus, and from thence to the Danube; and from time to time the Batavi and other warlike tribes of the north and northwest, who, like them, had been brought into partial dependence on the Romans, rose in formidable insurrection; but after Trajan had restored order and strengthened the forts, peace remained undisturbed in the north, till the beginning of the third century, while, with the exception of the sanguinary war of the Marcomanni and Quadi under Marcus Aurelius, which began about the year A.D. 166, there was a similar absence of hostilities in the south. But with the third century the tide of war turned, and the Romans were now compelled to defend their own empire from the inroads of the numerous Germanic tribes, foremost among whom stood the powerful confederacies of the Alemanni and Franks. In their track followed, during the next two centuries, successive hordes of the Vandals, Suevi, Heruli, Goths, and Longobards, who soon formed for themselves States and principalities on the ruins of the old Roman provinces. From this period almost down to the establishment of the Western Empire in the person of Charlemagne, the history of Germany is a blank; but the condition of the country when he entered on the possession of his German patrimony showed that since the retirement of the Romans the lesser tribes had become gradually absorbed in the larger, for on his accession the land was held by a few great nations only, as the Saxons, Frisians, Franks, Swabians, and Bavarians, whose leaders exercised sovereign power within their own territories, and, in return for military services, parceled out their lands to their followers.

The knowledge which we possess of the habits and government of the ancient Germans is principally derived from the *Commentaries* of Cæsar and the *Germania* of Tacitus. According to the Roman historians, the Germans were a people of high stature, fair complexion, and red or yellow hair, endowed with great bodily strength, and distinguished for an indomitable love of liberty. The men delighted in active exercises and the perils of war, and the women, whose chastity was without reproach, were held in high esteem. Each master of a family had absolute power over those of his household. Their habitations were generally separate, and surrounded by their several stalls and garners; for although there were villages whose inhabitants made common use of the fields and woods surrounding them, the Germans seem to have preferred isolated and detached dwellings to aggregate settlements. Towns and cities they long regarded with aversion, as inimical to personal freedom. In regard to their political organization, it would appear that several villages formed a 'hundred,' several hundreds one 'gau,' and several gaus one 'tribe.' In each tribe the people were divided into four classes—nobles, freemen, freedmen or vassals, and slaves. The King or chief was elected from among the nobles; but his power was very limited, and the government of the several tribes seems to have been democratic rather than monarchical.

The religion of the Germans, which is shrouded in great obscurity, was based upon myths of the creation of the world, and the existence of gods having the forms and attributes of a perfect humanity. The different tribes had all their special gods or demigods, who were often their own leaders or chiefs, to whom the attributes of the god

to whose worship they were most partial were ascribed. It is generally said that the Germans had neither temples nor statues. Both Cæsar and Tacitus expressly affirm this, but it cannot be regarded as literally true, for Tacitus himself mentions a temple of a goddess Tanfana among the Marsians; and at a later period we find Christian missionaries exhorting the Germans to change their pagan temples into Christian churches, while we also read of the destruction of pagan idols. Nevertheless, the religion of the Germans was mainly carried on in the open air in groves and forests, and on heaths and mountains. Although a priestly order also existed among the Germans, yet each master of a household performed religious services for himself and his family within his own homestead. A knowledge of the will of the gods and the events of the future was sought by divination, from observations of the flight of birds, the rushing of waters, and other similar signs, in the interpretation of which women were thought to be especially skilled. Belief in a future life, and in an abode after death for those who had deserved well in this life, was cherished among the Germanic races, who had a strong faith in retributive justice, whose sway they believed would be extended over the gods by involving them in a universal annihilating conflict as the punishment of their evil deeds, after which a new world was to arise, guarded by a pure and perfect race of gods. In addition to the higher deities, the Germans peopled every portion of space with a class of subordinate beings who pervaded the earth, air, and water, in the shape of elves, nixies, kobolds, dwarfs, and giants; while Norns and Valkyrs stood apart from either grade of spiritual existence as the representatives of destiny like the Moiræ and Parcæ of the Greeks and Romans. Consult: Tacitus, *Germania*; Cæsar, *De Bello Gallico*, book vi.; Kingsley, *The Roman and the Teuton* (London, 1887).

GERMANICUS CÆSAR (B.C. 15-A.D. 19). A distinguished Roman general. He was the son of Nero Claudius Drusus and Antonia, daughter of Marcus Antonius, and niece of Augustus, and was born in September, B.C. 15. He was adopted in the year A.D. 4 by Tiberius, whom he accompanied in the war waged against the Pannonians and Dalmatians, for the purpose of securing the German frontiers after the defeat of Varus. After having been consul in A.D. 12, he was appointed in the following year to the command of the eight legions on the Rhine. On the death of Augustus, in A.D. 14, the soldiers revolted, demanding higher pay and a shorter period of service. Germanicus hastened from Gaul (where he happened to be at the time) to remind them of their duty. The soldiers urged him to seize upon the supreme power, but he refused. He, however, granted their demands, though his colleague, A. Cæcina, secretly massacred the ring-leaders at night. Germanicus now led the legions over the Rhine below Wesel, attacked the Marsi during a nocturnal festival, and destroyed their celebrated temple of Tanfana. In A.D. 15 he made a second inroad into Germany. Proceeding from Metz into the country of the Catti, he destroyed their chief town of Mattium (Maden, near Gudensberg). On his return, his assistance was implored by the ambassadors of Segestes (always a firm ally of the Romans), who was besieged by his son-in-law, Arminius, the con-

queror of Varus. This was at once given, and Thusnelda, the heroic wife of Arminius, fell into the hands of the Roman general. Arminius, burning with anger and shame, now roused the Cherusci and all the neighboring tribes to war. Germanicus, in consequence, commenced a third campaign. He separated his army into three divisions. The main body of the infantry was led by Cæcina through the country of the Bructeri, the cavalry under another general marched through Friesland, while Germanicus himself sailed with a fleet through the Zuyder-Zee into the German Ocean, and proceeded up the River Ems, where he joined the others. The united divisions now laid waste the country in the neighborhood of the Teutoburg Forest, and gathering up the bones of Varus and his legions, which had lain there for six years, buried them with solemn funeral honors. A victory gained by Arminius induced Germanicus to make a hasty retreat, during which he lost part of his fleet in a tempest. Cæcina, who retreated by land, sustained severe losses at the hands of the pursuing Germans. Before the fleet of 1000 vessels, which Germanicus had built at Batavia, was equipped, he was recalled over the Rhine in A.D. 16 by news of the beleaguering of the recently acquired fortress of Aliso, on the Lippe. The Germans were repulsed, and the funeral mound in the Teutoburg Forest, which they had thrown down, was again erected. Germanicus now sailed with his fleet again into the Ems, pressed forward to the Weser, which he crossed, and completely overthrew Arminius in two battles. Nevertheless, he resolved to return, and on his way again lost the greater part of his fleet in a violent storm. In order to prevent this mishap from giving courage to the Germans, he once more, in the same year, marched into the country of the Marsi, and dispatched his lieutenant Silius against the Catti. Tiberius, jealous of his glory, recalled him, and feigning good-will, bestowed upon him the honor of a triumph, in which Thusnelda appeared among the captives. To rid himself of Germanicus, whose popularity seemed to render him dangerous, Tiberius sent him, in A.D. 17, with extensive authority, to settle affairs in the East, at the same time appointing Piso Viceroy of Syria, who everywhere counteracted the influence of Germanicus. Germanicus died at Epidaphnæ, near Antioch, October 10, A.D. 19, probably of poison. He was deeply lamented by both the inhabitants of the provinces and the citizens of Rome, whither his ashes were conveyed, and deposited by his wife, Agrippina, in the mausoleum of Augustus. Agrippina herself and two of her sons were put to death by order of Tiberius; her third son, Gaius (afterwards the Emperor Caligula), was spared. Of the three daughters who survived their father, Agrippina became as remarkable for vices as her mother had been for her virtues. Besides his splendid generalship, Germanicus was conspicuous for his magnanimity, benevolence, finely cultured understanding, and personal purity of life. He wrote several works of a rhetorical character, which have been lost; but of his poetical works, we possess an epigram, a version of the *Phænomena* of Aratus, and fragments of a work of the same character, entitled *Diosemeia*, or *Prognostica*, compiled from Greek sources. Germanicus's literary remains were first published at Bologna, in 1474. The latest edition is that of Breysig (Berlin, 1867).

GERMANIUM (Neo-Lat., from Lat. *Germania*, Germany). A metallic chemical element discovered by Winkler in 1886 in the mineral argyrodite, of which it forms about 9.6 per cent. Its properties had been previously predicted, from the periodic law (q.v.), by the Russian chemist Mendelëeff, who gave it the provisional name of *eka-silicon*. It is found in small quantities in various minerals, from which it is obtained as a sulphide, and then reduced to the metallic condition by heating in hydrogen.

Germanium (symbol, Ge; atomic weight, 72.3) is a grayish-white lustrous brittle metal that melts at about 900° C., and has a specific gravity of 5.5. It combines with oxygen to form a germanic oxide and a germanious oxide, and with other elements to form a series of germanic and germanious salts.

GERMAN IVY, *Herniaria glabra*. A clinging plant often seen in parlor or garden culture, indigenous to Southern Africa. It bears clusters of yellow flowers, and the stems grow eight or ten feet high. It is well adapted to window culture. See **IVY**.

GERMAN LANGUAGE. A sister language of English and Frisian, these three together constituting what is generally called the 'West-Germanic' or 'West-Teutonic' division of the Germanic group of the Indo-Germanic languages. German as a general term includes both the High and Low German dialects. But High German being the literary language and the language of the educated classes, the term German is frequently used as equivalent to High German.

AREA OF THE GERMAN LANGUAGE. The area of the German language is not identical either with that of the German stock or that of the German Empire. Thus, in the larger part of Eastern Germany (the country east of the rivers Elbe and Saale), the German-speaking population is, as far as the race is concerned, largely of Slavic, or, in some cases, Baltic origin. In this region the boundary between Slavs and Germans has been subjected in course of time to various changes. At the earliest historic period (at the time when Tacitus wrote his *Germania*) Eastern Germany was held by Germanic tribes. Later on, probably in the sixth century, the inroad of the Slavs began, who by the middle of the eighth century had succeeded in crowding the Germans back even beyond the left banks of the Elbe and Saale. From the time of Charlemagne to the present date the Slavonization of the East has been followed by its Germanization, or rather re-Germanization. Except among the Wends or Lusatian-Sorbs around Cobus in Brandenburg, and the Lithuanians in the northeastern corner of East Prussia, German is now spoken throughout those parts of Prussia which constituted the kingdom at the time of the accession of Frederick the Great (1740). It is only by many of the geographical names (including such familiar names as Pomerania, Silesia, Berlin, Danzig, Dresden, Leipzig, etc.) that the former extent of the Slavic settlements in Germany may still be traced. Toward the end of the eighteenth century, however, when in 1772, 1793, and 1795—under Frederick the Great, and his successor, Frederick William II.—the Kingdom of Poland was divided between Russia, Austria, and Prussia, a new lot of Slavic inhabitants, and this time mostly of Polish extraction, fell to Prussia.

(which already possessed a large Polish population in Silesia) as its share in the partition; with the result that at present Polish is the mother tongue of about one-tenth of the whole population of Prussia.

If we turn to other parts of Germany, we meet with Danes in the northern portion of the Prussian District of Schleswig, which until 1864 belonged to Denmark, and with Frenchmen in the western portion of the Reichsland of Alsace-Lorraine, which was retaken from France after the war of 1870-71.

Of the 56,000,000 inhabitants of the German Empire returned in the census of 1900, upward of 4,200,000 were entered as speaking foreign languages. Of this number, nearly 3,330,000 were Poles (including Kassubs and Mazurs), 107,000 Czechs and Moravians, 93,000 Wends, 106,000 Lithuanians, nearly 224,000 French, 141,000 Danes, 80,000 Dutch, 66,000 Italians, and 20,000 Frisians.

German is the vernacular of almost the whole of Luxemburg, of the greater part of Switzerland, and of portions of Austria-Hungary. In Luxemburg the German-speaking population in 1900 amounted to 221,000 (out of a total population of 236,500), in Switzerland to 2,319,000 (or 69 per cent. of 3,325,000), in Cisleithan Austria to 9,171,000 (or 36 per cent. of 25,633,100), in Hungary to 2,135,181 (or 12 per cent. of 19,254,559).

Russia, too, has a German element of some importance. There are many German settlements in the Southern Russian provinces, one of them, founded in 1768 (between Kamyshin and Volsk on the Volga), consisting of 173 villages, and covering an area not much smaller than that of the Kingdom of Saxony. German has, moreover, from the thirteenth century on been the language of the educated classes in the Baltic provinces of the Russian Empire (i.e. in Courland, Livonia, and Esthonia). As regards the numerical strength of the German element, the latest accessible statistics are those of 1883, in which they are reckoned as forming 1.5 per cent. of the population of European Russia. If we apply this ratio to the census of 1897, when the population of European Russia was 105,542,033, the number of German inhabitants would amount to about 1,500,000.

Outside of Europe the largest number of Germans is found in the United States, whose German-born population amounts to about 3,000,000. For the city of New York alone the census of 1900 gives the German-born population as 322,343. In addition to these we have the 'Pennsylvania Germans' or 'Pennsylvania Dutch,' whose dialect is still the vernacular of many districts in the State of Pennsylvania. An exact count of the Pennsylvania Germans has apparently never been made. Their number is by no means identical with that of the Pennsylvanians of German descent. There is a large German population in Brazil and Argentina, as well as in Canada and other parts of the British Empire, and there are many Germans scattered in all parts of the world.

Altogether German is nowadays spoken by about 75,000,000 people. German thus ranks third in number among the four leading languages of Europe, the first being English, the second Russian, and the fourth French.

Our figures for German do not include the

Dutch language. For although Dutch, from a linguistic point of view, represents the Low German branch of the Franconian dialect, it has developed a literary language of its own, and, therefore, is to be regarded as a separate language. In like manner Flemish is left out of consideration.

On distribution, consult: Kiepert, *Uebersichtskarte der Verbreitung der Deutschen in Europa* (Berlin, 1887); Nabert, *Karte der Verbreitung der Deutschen in Europa* (Glogau, 1891, in 8 sections); id., *Das deutsche Sprachgebiet in Europa* (Stuttgart, 1893); Hübner, *Geographisch-statistische Tabellen aller Länder der Erde* (51st edition, Frankfurt, 1902).

THE GERMAN DIALECTS. From the earliest times German has been divided into several dialects. Of course, these dialects must not be regarded as representing a corrupted form of the written language. On the contrary, they are—in Germany, as elsewhere—the natural and genuine offshoots of the language, whereas the written language represents one of their number artificially restrained in its natural development. It is only by drawing constantly on the dialectic vocabulary and by adapting itself more or less to the grammar of the living dialects that the written language succeeds in sustaining its vitality.

Except in the territory formerly held by the Slavs, the distribution of the German dialects has within the last thousand years undergone few changes, and a map of the Old High German dialects may be brought up to date with comparatively slight alterations. There is little doubt that dialectic differences were originally the outcome of ethnographical divisions of the German tribes, and since as early as the third century A.D. we meet with tribal unions, such as the Alemanni, the Franks, and the Saxons, we may date back to this time the origin of the corresponding dialects. At first the differences between these dialects were slight; but in the course of several centuries they became more pronounced.

One event in the history of the German language is in this respect of special importance, the second or High German shifting of consonants. This second shifting is similar to the first, which had occurred several centuries earlier; so similar, indeed, that the formula known as 'Grimm's law' (q.v.) applies, with slight modifications, to the second as well as to the first shifting. There are, however, some important differences. First: While by the first shifting three classes of sounds (the *tenues*, *mediæ*, and *aspirates*) were concerned, the second is limited to only two classes, the *tenues* *p*, *t*, *k*, and the *mediæ* *b*, *d*, *g*. Second: While the first shifting is essentially the same in all Germanic languages, the second or High German shifting varies from dialect to dialect. In some of the dialects the shifting of the *tenues* and *mediæ* is almost as systematic as in the case of the first shifting, whereas in others it is confined to only a few among the six consonants concerned.

The second shifting began in the seventh century A.D. It started from the Alps in the most southern region of the German territory, and spread with unbroken force over the Alemannic and Bavarian dialects. It then advanced, with

diminishing energy, farther north into the Franconian territory, making its entry from the southeast, and progressing from there along the Main and Rhine rivers. By the time it had reached Cologne most of its energy was spent, and soon afterwards, after crossing the 51st degree of latitude, it came to a stop entirely, without reaching the northern Franconian or the Saxon dialects.

As a result of the second shifting we have a clearly defined division of the German dialects into three main groups (the second having various subdivisions), according to the degree in which they have been affected by the shifting.

I. *Upper German*.—The dialects in which the second shifting has been carried out to its full extent. They are divided into (1) *Alemannic* (west of the River Lech), and (2) *Bavarian* (east of the Lech). The Alemannic is again subdivided into (a) South Alemannic in Switzerland and in the southern districts of Baden and Württemberg, (b) Alsatian, (c) Swabian. The subdivisions of the Bavarian are: (a) Upper Bavarian and Austrian, which constitute the main body of the Bavarian dialect; (b) the dialect of the Upper Palatinate (*Oberpfalz*) in Northern Bavaria, west of the Bohemian Forest. It may be noted that the German dialects spoken in Hungary (especially in the Transylvanian Saxon Land) belong to the Midland, not to the Upper German type. It may be inferred from their dialect that these Germans are immigrants from Western Germany, and that most of them came from the lower Rhine.

II. *Midland German*.—The dialects which have been affected by the shifting in a lesser degree. Among these are:

(1) *East Franconian* (the dialect of the old Duchy of Franconia Orientalis), which is of special interest, as it exhibits the shifting in the form in which it has found its way into the literary language of Modern German. The tenuis *t* and *p* are shifted in Modern German in two different ways, to *z* and *pf*, respectively, both at the beginning of a word and after consonants (e.g. Engl. *to* = Ger. *zu*, Engl. *heart* = Ger. *Herz*, Engl. *penny* = Ger. *Pfennig*, Engl. *stump* = Ger. *Stumpf*), and to *zz* (= Mod. Ger. *ss*) and *ff* after vowels (e.g. Engl. *eat* = Ger. *essen*, Engl. *ape* = Ger. *Affe*). The tenuis *k* is shifted to *ch* after vowels (e.g. Engl. *make* = Ger. *machen*), while it remains unchanged when initial (e.g. Engl. *can* = Ger. *kann*). The dental media *d* is always shifted to *t* (e.g. Engl. *deal* = Ger. *Teil*, Engl. *side* = Ger. *Seite*), whereas the labial and the guttural mediae are not affected by the shifting. North of the East Franconian we find:

(2) The *Thuringian* dialect, which by the colonization of the former Slavic territory has spread to the east over what is now the Kingdom of Saxony, and the Prussian Province of Silesia, giving rise there to the Upper Saxon or Misnian (*Meissnisch*) and to the Silesian dialects. At an earlier date Thuringian apparently differed but little from East Franconian. But in course of time the differences have become more pronounced, especially so if we compare the Upper Saxon and Silesian with the Franconian dialects. Thus it is characteristic of the Saxon dialect that it has almost lost the distinction between voiced and voiceless consonants, so that at present the mediae *b*, *d*, *g*, are not distinguished in pronun-

ciation from the tenuis *k*, *t*, *p*. West of Thuringian and East Franconian there follows:

(3) *Rheno-Franconian* (the dialects of the former Franconia Rhenensis, of the Palatinate of the Rhine, and of the larger part of Hesse). It is chiefly from the dialect of the Palatinate that the Pennsylvania German in America has developed. The shifting differs from that of East Franconian and Modern German, especially in that initial *p* and initial *d* have not been shifted (e.g. Engl. *pipe* = Penn. Ger. *paife*, Modern German *Pfeife*, Engl. *deal* = Penn. Ger. *dcl*, Modern German *Teil*). Still more limited is the shifting in

(4) *Middle-Franconian* (the dialects spoken along the banks of the Moselle and of the Rhine from Coblenz to Düsseldorf). Middle Franconian is characterized by the fact that *t* is kept—in accordance with Low German—in a few pronominal forms, while otherwise it is shifted to *z* or *ss*, as in High German. We find, therefore, e.g. in Cologne *et*, *dat*, *wat* = Engl. *it*, *that*, *what*; but *zo* = Modern German *zu*, Engl. *to*, and *wiess* = Modern German *weiss*, Engl. *white*.

The Upper German and the Midland German dialects are both comprehended under the term 'High German,' in distinction from the remaining group, the 'Low German.'

III. *Low German*.—The dialects which have not been reached by the second shifting. These include not only the *Platt* or *Platt-deutsch* in Northern Germany, but also the dialects of Belgium and Holland (with the exception, of course, of the French and the Frisian districts of the Low Countries). We have two divisions:

(1) *Low Franconian*, or the German dialects in the northeastern corner of Rhenish Prussia, and the adjoining Flemish and Dutch dialects in Belgium and Holland.

(2) *Low Saxon*, or the Low German dialects of Westphalia, Oldenburg, Hanover, Brunswick, Holstein, Mecklenburg, and the Prussian provinces of Brandenburg, Pomerania, and East and West Prussia. It is to be noted that east of the Elbe, in the former Slavic territory, the Low German has (except in Holstein, Mecklenburg, and Pomerania) generally undergone a mixture with Midland German dialects.

The lack of the shifting is, of course, merely a negative criterion, and if we comprehend Low Franconian and Low Saxon under one group, we ought not to overlook the fact that the former was at an earlier date more closely connected with the Franconian dialects in Midland Germany. Its vocalism is, in fact, to this day nearer to that of High German and of the Midland German dialects than to that of the Low Saxon.

Low Saxon is subdivided into two distinct dialects, Northern Saxon (or Low Saxon proper) and Westphalian; the latter including in addition to the Prussian Province of Westphalia, also the northern portions of Waldeck and Hesse, the whole of Lippe, and part of Southern Hanover (e.g. Osnabrück). The principal difference between the two lies in the fact that in the Westphalian dialects we find a rather complicated vocalism, and generally an abundance of diphthongs, whereas Northern Saxon has few diphthongs, and altogether a very simple vowel-system.

For a complete list of grammatical treatises and dictionaries on the German dialects down to

1890, consult Mentz, *Bibliographie der deutschen Mundartenforschung* (Leipzig, 1892); for a briefer list, Kauffmann, in Paul, *Grundriss der germanischen Philologie*, i. (2d ed., Strassburg, 1901). As to poems, fiction, etc., written in these dialects, there is no later attempt at a bibliography than the one made by Carl H. Herrmann, in his *Bibliotheca Germanica* (Halle, 1878). Collections of specimens from the various dialects are: Firmenich's *Germaniens Völkerstimmen* (3 vols. and appendix, Berlin, 1841-66), very complete and interesting; and Welcker's *Dialektgedichte* (2d ed., Leipzig, 1899), a smaller anthology.

A dialect map of the earlier periods is found in Piper's *Verbreitung der deutschen Dialekte bis um das Jahr 1300* (Lahr, 1880). For the modern dialects the maps by Bremer, in Brockhaus's *Konversations-Lexikon*, new 14th ed., vol. iv. (Leipzig, 1901; art. "Deutsche Mundarten"), and by M. Maurimann, in Meyer's *Konversations-Lexikon*, vol. iv., 5th ed. (Leipzig, 1894; art. "Deutsche Sprache"), will be found the most serviceable. A comprehensive dialect map of Germany was undertaken many years ago by G. Wenker. After the first number had appeared (Strassburg, 1881; now out of print) the plan of the work was changed, so as to give a separate map to the dialectic forms of a single word. In its present form this *Sprachatlas* will probably not be published, but the single maps are deposited in manuscript in the Royal Library of Berlin. By January, 1902, the number of finished sheets (each three forming one map) amounted to no less than 610. This work has originated a new method for the cartography of living dialects. The dialect-map in Paul, *Grundriss der germanischen Philologie* (2d ed., Strassburg, 1901), should also be consulted.

OLD AND MIDDLE HIGH GERMAN. In the history of High German three main periods are distinguished—Old High German, from the eighth century to about 1100; Middle High German, from about 1100 to 1500; Modern German, from about 1500 to the present time. These periods apply both to dialects and to the literary language. It is, however, only in Modern German that the literary language has become distinctly separated from the dialects. In Middle High German we have only the beginnings of a literary idiom, while in Old High German there is no trace of a common written language in distinction from the dialects. The dates given are meant only to fix roughly the beginning and the end of each period. There is, in fact, no distinct break in the development of the High German language, but rather a gradual transition from one period to the other.

Old High German is characterized especially by the preservation of full vowels in its inflectional endings, e.g. *nimu*, *neman*, *tagum*, *hano*, *hanin*, *zungân*.

In Middle High German these vowels are uniformly weakened to *e*, so that, e.g. the above words appear in the following form: *nime*, *nemen*, *tagen*, *hane*, *hanen*, *zungen*. Traces of this weakening appear first in the Franconian dialect, and become more general toward the end of the eleventh century. Many instances of full vowels, however, in inflectional endings are still found in the Middle High German literature of the early twelfth century, so that the period from about

1080 to 1150 may be regarded as a transition period from Old High German to Middle High German.

There is, as has been stated, in Middle High German no generally accepted literary language as one is found in the written language of Modern German. Thus, Heinrich von Veldeke's language points as clearly to the Low Franconian dialect as does Hartmann von Aue's to the Swabian. But, on the other hand, in the case of Wolfram von Eschenbach, who was born in the Franconian portion of Bavaria, it is difficult to determine how far he used his own dialect and how far he gave the preference to the Swabian. Most of the leading poets of this period lived in that part of Germany where the 'Upper German' dialects were found, especially in Alsace, Swabia, Bavaria, and Austria. Hence it is only natural that there should have developed in Southern Germany a tendency to a certain uniformity in the written language as to grammatical forms and literary expression. This does not mean that the Middle High German poems belonging to this group entirely lost their local coloring; it means only that their language rose to a certain extent above the level of the dialects, in that certain dialectic peculiarities were avoided, while others were apparently regarded as unobjectionable. The fact, in any case, remains that in the works of Hartmann von Aue, Gottfried von Strassburg, Walther von der Vogelweide, and also in the *Nibelungenlied* and *Gudrun*, we find essentially the same language. If we were to identify this language with a single dialect we should probably call it Swabian, though it has been recently proved that it omits several of the salient features of the Swabian dialect of this period. It must, therefore, be regarded as the literary form of the Swabian dialect, risen to the rank of the literary language of Southern Germany generally, though it appears with slight variations in the different provinces.

The period of 'classical' Middle High German—in other words, the time of the hegemony of literary Swabian—comes to an end in the latter half of the thirteenth century. From about 1250 we have a transition period, during which the leadership is gradually passing to the Midland German dialects.

Convenient helps to the study of Old High German are Braune, *Abriss der althochdeutschen Grammatik* (3d ed., Halle, 1900), or Wright, *Old High German Primer* (Oxford, 1888), and Braune, *Althochdeutsches Lesebuch* (5th ed., Halle, 1902). The most complete Old High German dictionary is Graff, *Althochdeutscher Sprachschatz* (7 vols., Berlin, 1834-46). This excellent work is unfortunately arranged according to roots, but the seventh volume contains an alphabetical index by Massmann.

There are numerous Middle High German grammars and readers, e.g. Wright, *Middle High German Primer* (2d ed., Oxford, 1899); Paul, *Mittelhochdeutsche Grammatik* (5th ed., Halle, 1900); Michels, *Mittelhochdeutsches Elementarbuch* (Heidelberg, 1900); Weinhold, *Mittelhochdeutsche Grammatik* (2d ed., Paderborn, 1883); id., *Mittelhochdeutsches Lesebuch*. The standard dictionaries of Middle High German are Benecke, *Mittelhochdeutsches Wörterbuch*, edited by Müller and Zarncke (3 vols., Leipzig, 1854-66); Lexer, *Mittelhochdeutsches Handwörterbuch* (3 vols., Leipzig, 1872-78); id.,

Mittelhochdeutsches Taschenwörterbuch (6th ed., Leipzig, 1901).

MODERN GERMAN. It is characteristic of the literary language of Modern German that it is based on the Midland German rather than on the Upper German dialects. The points in which it differs from the Middle High German 'Literary Swabian' are especially these: (1) the M. H. G. long vowels *i*, *u*, *û* (the latter spelled *iu* in M. H. G.) have been changed to the diphthongs *ei*, *au*, *eu*; e.g. M. H. G. *min* = M. Ger. *mein*, M. H. G. *hûs* = M. Ger. *Haus*, M. H. G. *hiute* = M. Ger. *heute*; (2) the M. H. G. diphthongs *ie*, *uo*, *üe*, have been changed to the long vowels, *i* (spelled *ie*), *u*, *ü*; e.g. M. H. G. *spiegel* = M. Ger. *Spiegel* (i.e. *spigel*), M. H. G. *muot* = M. Ger. *Mut*, M. H. G. *behüeten* = M. Ger. *behüten*; (3) the M. H. G. short vowels *a*, *e*, *i*, *o*, *û*, have been lengthened in stressed 'open' syllables (i.e., in stressed syllables ending in a consonant); e.g. M.H.G. *name* = M. Ger. *Name* (pron. *nâme*), M. H. G. *nemen* = M. Ger. *nehmen*, M. H. G. *gebliben* = M. Ger. *geblieben*, M. H. G. *oben* = M. Ger. *oben* (pron. *öben*), M. H. G. *über* = M. Ger. *über* (pron. *über*); (4) initial *s* has passed into *ß* (spelled *sch*) before *l*, *m*, *n*, *w*; e.g. M. H. G. *slagen* = M. Ger. *schlagen*, M. H. G. *smenze* = M. Ger. *Schmerz*, M. H. G. *sniden* = M. Ger. *schneiden*, M. H. G. *swære* = M. Ger. *schwer*; (5) the difference in the strong preterit between the stem-vowel of the singular and that of the plural is generally discarded; e.g. M. H. G. *ich bleip*, *wir bliben* = M. Ger. *ich blieb*, *wir blieben*, M. H. G. *ich half*, *wir hulfen* = M. Ger. *ich half*, *wir halfen*. There are in addition to these differences many others, but those mentioned stand first in importance.

In almost every case we are able to trace the origin and the spread of these changes in the Midland German dialects for a long time before they were incorporated in the literary language. Of special interest is the diphthongization of Middle High German *i*, *u*, *û*, in that this was originally an Austro-Bavarian peculiarity, which spread from Bavaria and Austria over East Franconia, and from here over the neighboring Midland German districts.

The history of the Modern German written language may be traced back to the middle of the fourteenth century, when, under the Emperor Louis the Bavarian (1314-47), the Imperial Chancery adopted German instead of Latin in its official documents. There existed at this time in the different parts of Germany several *Kanzleisprachen*, or official languages. The mutual intercourse between the various centres furnished the basis for greater uniformity, and it is only natural that the language of the Imperial Chancery should have gained a predominating influence. The dialect adopted by the Imperial Chancery was essentially that of the Imperial Court, which at the time of the Luxemburg emperors (1347-1437) was stationed at Prague. It was accordingly a dialect whose consonantism was East Franconian, and in which the Middle High German long vowels *i*, *u*, *û* had been replaced by the Austro-Bavarian diphthongs *ei*, *au*, *eu*. The adoption of this dialect by the Imperial Chancery led to its introduction, in the second half of the fifteenth century, into the chanceries of the neighboring principalities of Saxony and Thuringia. A further step was its adoption, be-

tween 1480 and 1500, by the Meissen and Saxon municipalities and courts and by the universities of Leipzig and Wittenberg. By 1500 it had become, in Saxony and Thuringia, not only the generally accepted official language, but was also largely used in private correspondence and as the written language among the educated classes.

The popular belief which ascribes to Luther the foundation of the Modern German literary language is not well founded. When, in 1522, Luther published his translation of the New Testament, he simply made use of a written language which was by this time pretty firmly established. Luther's own words bear witness to this, for he says in his *Table Talk* (ch. lxix.): "I have no particular language of my own in German, but use the common German language so that both High and Low Germans may understand me. I follow the language of the Saxon Chancery, which all the princes and kings in Germany take as their model; all the free Imperial cities and all the courts of princes write according to the Chancery of the Saxons and of our prince. Hence it is the most common German language. Emperor Maximilian and the Elector Frederick, Duke of Saxony, have thus united into one fixed language the German languages of the Roman Empire." This much is true, that Luther's translation of the Bible, his catechisms, his hymns, and his numerous pamphlets were largely instrumental in spreading this language from Midland Germany over the whole of the German Empire, and in overcoming the obstacles which for a long time militated against its acceptance as the written and literary language of all Germany. The latter result was achieved in the course of the sixteenth and seventeenth centuries, when first (between about 1550 and 1600) Northern Germany, afterwards Southern Germany, and finally Switzerland joined the movement. It is hardly before about 1750 that the literary language can be said to have received its present form.

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Grammars: (a) Historical: Grimm's *Deutsche Grammatik* (4 vols., rev. ed., Berlin and Güttersloh, 1870-78) is rather a comparative grammar of the Teutonic languages; Wilmanns, *Deutsche Grammatik* (vols. i. and ii., 2d ed., Strassburg, 1897-99; vols. iii. and iv. have not yet appeared). (b) Practical: Blatz, *Neuhochdeutsche Grammatik* (2 vols., 3d ed., Karlsruhe, 1895-96); Sanders, *Wörterbuch der Hauptschwierigkeiten der deutschen Sprache* (24th ed., Berlin, 1892), a grammar in alphabetical order; Thomas, *A Practical German Grammar* (New York, 1895); Bierwirth, *The Elements of German* (ib., 1900); Harris, *German Lessons* (Boston, 1892).

Dictionaries: (a) Historical and etymological: Grimm, *Deutsches Wörterbuch* (Leipzig, 1854 et seq.), will consist of sixteen volumes (counted as vols. i.-xiii.), of which nine have appeared; Sanders, *Wörterbuch der deutschen*

Sprache (3 vols., Leipzig, 1860-65); the *Eränzungs-Wörterbuch der deutschen Sprache* (Berlin, 1885), by the same author, is a supplement to the preceding; Heyne, *Deutsches Wörterbuch* (3 vols., Leipzig, 1890-95); id., *Deutsches Wörterbuch, Kleine Ausgabe* (in 1 vol., ib., 1896); Kluge, *Etymologisches Wörterbuch der deutschen Sprache* (6th ed., Strassburg, 1899; an English translation of the 4th ed., London, 1891). (b) Practical: Flügel, *Universal English-German and German-English* (4th ed., 3 vols., Brunswick, 1891), and Muret, *Encyclopedic English-German and German-English Dictionary* (4 vols., Berlin, 1894-1901), are the two most comprehensive English-German dictionaries. Other recent and very useful works are: Flügel-Schmidt-Tanger, *Dictionary of the English and German Languages for Home and School* (2d ed., 2 vols., Brunswick, 1897), and the new edition, by A. Schröer, of Grieb's *English-German and German-English Dictionary* (10th ed., 2 vols., Stuttgart, 1898-1902; all the editions of Grieb previous to this one are antiquated). Among the one-volume dictionaries the one by Weir (Cassell's *New German Dictionary*, London, 1888, identical with Heath's *New German Dictionary*, Boston, 1888), deserves special mention.

SPELLING AND PRONUNCIATION. Germany has an orthographical problem of her own, although a less complicated one than England and America. The spelling of Modern German had become pretty well settled in the latter half of the eighteenth century, when Gottsched (*Deutsche Sprachkunst*, Leipzig, 1748) and Adelung (*Anweisung zur deutschen Orthographie*, ib., 1788) were the chief authorities; and there were only slight changes (due especially to the grammatical works of J. Chr. A. Heyse) in the early nineteenth century. More recently, however, when the works of Jakob Grimm and his followers had led to a better understanding of the history of the German language, and when phonetics had become an essential element in the study of grammar, a more radical reform than that attempted by Heyse was advocated by many scholars. Opinions, however, differed as to whether the reform should rest primarily on an historical or a phonetic basis. The uncertainty in orthographical matters was on the increase, and in 1876 the Prussian Government decided to call to Berlin a conference of German philologists, principals of schools, and publishers. This conference had no immediate practical outcome, though its transactions were instrumental in clearing the way for subsequent regulations. Four years later the Prussian Minister of Instruction (von Puttkamer) introduced in the Prussian schools a uniform spelling, the rules for which are contained in the *Regeln und Wörterverzeichnisse für die deutsche Rechtschreibung* (Berlin, 1880). This *Preussische Schulorthographie*, however, could only mean a temporary solution of the difficulty. Its rules were often (e.g., as to the use of *th* and *t*) complicated and generally of such a character as to satisfy neither the conservatives nor the advocates of reform. It became finally necessary for the Prussian Government to call at Berlin in 1901 a second conference, in which the Southern German States and the Austrian and Swiss governments were also represented. The result is the revised edition (*Neue Bearbeitung*) of the above-mentioned *Regeln und Wörterverzeichnisse* (Berlin,

1902). The new regulations are simpler than the former ones, although they imply more radical changes. They have been introduced in both German and Austrian (and also Swiss) schools, and have at the same time been adopted by most of the leading newspapers. There is every prospect that for all practical purposes the problem of spelling has been successfully solved for a long time to come.

With the pronunciation of German the case is different. Neither has there been nor is there at present a generally recognized standard pronunciation; so that in this respect the union of Northern and Southern Germany is not yet perfected. In Southern and Midland Germany the difference between the literary language and the dialect is not fundamental enough to consider the two as different languages. We find, therefore, that the pronunciation even of cultured people is almost always more or less tinged by their native dialect. The Swabians, the Swiss, the Austrians, and the Saxons are, as a rule, easily recognized by their pronunciation. In Northern Germany the Low German dialects and the literary idiom are regarded as different languages. But as High German here has been for several centuries the language of the educated classes, it has again developed local peculiarities and dialectic differences of its own.

It is claimed by many that the language of the theatre—which, if not entirely so, is, on the whole, uniform throughout Germany—must be regarded as dialect-free and as the standard pronunciation. This contention, however, is contradicted by others, who maintain that the pronunciation of the stage, while essentially Southern German, is partly based on arbitrary regulations, and that it has no legitimate claim to the position of a standard pronunciation outside of the theatre. It is not very likely that the question of pronunciation will be satisfactorily settled within the present generation.

BIBLIOGRAPHY. *Verhandlungen der orthographischen Konferenz in Berlin* (Berlin, 1876); Wilmanns, *Die Orthographie in den Schulen Deutschlands* (2d ed., Berlin, 1887); Hempl, *German Orthography and Phonology* (part i., Boston, 1897); Duden, *Orthographisches Wörterbuch der deutschen Sprache* (7th ed., based on the new regulations, Leipzig, 1902); Siebs, *Deutsche Bühnenaussprache* (2d ed., Berlin, 1901).

GERMAN LITERATURE. FIRST PERIOD (600-800). German literature, as distinct on the one hand from writing in German and on the other from such Teutonic writing as the Bible translations of Ulfilas, begins after the triumphs of the great migration and the conquest of the Empire. Forces that had been engaged in the struggle for dominion turned, about the year 600, to the glorification of the nation's heroes, almost at the same time that similar conditions were forming the Anglo-Saxon epic in England. But the songs of warrior gods and heroes exist only in tradition, and a few late recorded fragments, such as the *Hildebrandslied*. Then, with the segregation of the High Germans and their partial conversion, literary activity is largely absorbed by the Church and its interests, and from having been national becomes general, catholic. That there must have been a considerable body of German poetry in this period, both in Upper and Lower Germany, is made probable by

allusions in Latin authors. The central figures around whom the saga-cycles gathered were Ermenrich (Ermanaricus), a Gothic king of the fourth century, Theodoric the East Goth, Attila the Hun, the Burgundian Gunther (Gundicarius), and probably a little later and farther to the north, Siegfried, whom some, however, have thought possibly identical with the Arminius who defeated the Roman legions under Varus. All these sagas, or elements from them, seem to have been connected with one another before the close of the first period. The number of these epic songs was sufficient to suggest to Charles the Great the possibility of collecting them, and he gave orders to that effect. Of the result no trace has survived.

SECOND PERIOD (800-1100). The new temper shows itself in visions of judgment (*Muspilli*), lives of saints, epic Gospel narratives (*Heliand*) or harmonies (*Otfrid*), with an occasional monastic excursion into the political field (*Ludwigslied*). But already under the Othos the national spirit was reviving, and Frederick Barbarossa made the people once more conscious of a national mission that found a literary impulse in contact with the culture of the West and South through military expeditions and of the East through the Crusades. This appears first in the religious epics of the eleventh century (*Judith*, *Exodus*), legends of the various Marys, and episodes in the life of Christ. The German writing of this period hardly equals in interest or literary value that produced in contemporary England or France, but there are signs, especially at the close of the eleventh century, of a refining of the national taste. Of political ballads we have first the *Ludwigslied*, written late in the ninth century to celebrate a victory of Louis III. over northern tribes, and a song celebrating the reconciliation of Otho I. and his brother Henry, and there are also clear traces of others on the romantic adventures of the rebellious Duke Ernst of Swabia, a popular hero for his resistance to Conrad II. A long Latin epic on Walter of Aquitania, telling of his flight with his bride from the Court of Attila and his combat with King Gunther at Worms, attests a German original. In all these the native spirit dominates, as the old pagan superstitions do in a few incantations, such as the Meisburg songs. But, as is natural, the chief survivals of the writings of this time are from the poems with which churchmen sought to supplant the older sagas and to tame the national spirit. Best of these is the Low German or Old Saxon *Heliand* (Saviour), written in alliterative verse, apparently by a Saxon and at the request of Louis the Pious. The Gospel narrative is followed, but Christ becomes a German prince, the disciples are His thanes, and the local color is often naively Teutonic. *Otfrid's Krist*, with the same theme, is High German, and therefore more sophisticated, more didactic also. It is the first German rhymed verse. *Muspilli*, which is Bavarian, is of a more independent fancy in its apocalyptic vision; it retains the alliteration of the saga-epic, and mingles Christian and pagan elements in a way that strikingly illustrates the popular religious conceptions of High Germans of the ninth century. The most noteworthy German writer in Latin of this period was Notker Labeo (d.1022), a philosophic monk of Saint Gall, a translator of Aristotle and Boëthius.

THIRD PERIOD (1100-1300). The effect of the

Crusades was twofold. They revived epic memories of Charlemagne and Roland and of the triumphs of Alexander. The response was immediate. Before 1130 there was a *Rolandslied* and an *Alexanderlied*. Tales of German adventure soon followed (*Rother*, *Herzog*, *Ernst*, *Orendel*). Political, intellectual, and literary horizons widened together under the rule of Frederick II., and German literature blossomed into its first classical period. Growing ever more self-conscious, more national, during the closing years of the twelfth century, it greets us on the threshold of the thirteenth with its *Iliad*, the *Nibelungenlied*, and its *Odyssey*, the *Gudrun*. Here the people speak; meantime the Court circle is giving us the philosophic epics of Wolfram von Eschenbach, the popular poetic tales of Gottfried of Strassburg and Hartmann von Aue, the stirring political songs of Walther von der Vogelweide, and the melodious chorus of the Minnesingers. The forerunners of these Court poets were Lambrecht, Conrad, and Heinrich von Veldeke. Their successors show a rapid decline due to over-production and artificiality. Literature begins to yield in interest to history, form to matter, and lyric poetry follows close in the wake of the epic decline, so that by 1300 chivalrous love poetry is dead in Germany. There is in the treatment of the chivalric epics the same confusion of persons and their dates that is indicated in the remains of the earlier period. Rother is made grandfather of Charles the Great, but much that is told of him belongs to Roger of Sicily; the historic Duke Ernst is fused with the historic Ludolf, son of the Emperor Otho, who was also a rebel, and the resultant creation becomes a romantic Crusader, a mediæval rival of Ulysses in his wanderings and of Sindbad in his adventures among pygmies, giants, cyclops, and magnetic mountains. Orendel becomes also a sort of Ulysses, and German romantic fancy is found playing also with the Irish argonaut Saint Brendan, while it makes of the English martyr-King Oswald a half comic amorous Crusader. This free treatment of Christian saints implies a less serious view of the great issues of life, as though the Crusaders had made men more tolerant as they saw their Emperor Frederic II. contending with Saladin for the palm of magnanimity. Walther von der Vogelweide is bold in his teaching of a philosophic toleration, and a crusading poet says that at Acre you could hardly tell Christians from Jews or heathens. It was an age of awakening that found its first strong national voice in Heinrich von Veldeke, and it is not by chance that the recognition of his poetic primacy is associated with the Whitsuntide of 1284, when 70,000 German knights gathered at Mayence as guests of Barbarossa at the knighting of his sons. That event was an epoch in the national life, and the place that Veldeke won there by his *Encide* marked no less an epoch in German heroic verse. But from this time Latin sources of inspiration proved less congenial than the Franco-Celtic, and from that time the Court epic deals prevailingly with legends of Arthur, of the Grail, and of Charles the Great.

The masterpieces of this period are embraced within thirty years, from 1190 to 1220. Here is found the work of Hartmann von Aue (q.v.), Gottfried von Strassburg (q.v.), Wolfram von Eschenbach (q.v.), and Walther von der Vogelweide (q.v.). Here, too, the popular epics Gu-

drun (q.v.) and the *Nibelungenlied* (q.v.). The outburst was natural and spontaneous; all classes shared in it. The *Heldenbuch*, compiled and in part written in the fifteenth century by Kaspar von der Rhön, is but a working over of the embarrassment of the epic wealth of this earlier period. And among the *Minnesingers* the great Walther had worthy though unequal compeers in Heinrich von Morungen, Reinmar der Alte, and Gottfried von Neifen. Beginning in imitation of the Troubadours, they attain soon to a genuine expression of lyric emotion, and to originality of form which is sometimes artificial, but seldom without witness to a sense of beauty and a keen appreciation of melody, which is as surprising in the suddenness of its diffused manifestation as it is in the speed of its decline.

With the second quarter of the thirteenth century artificiality gains the upper hand in Ulrich von Liechtenstein (d.1255), and vulgarity in Neidhard von Redenthal (d.1240), and in Tannhäuser (d.1270) the dignity of lyric poetry is sacrificed wholly to a rather coarse spirit of comedy. The seriously minded express themselves didactically. Here again the best are first. Freidank's *Bescheidenheit*, Thomasin von Zerklare's *Wälsche Gast*, show a lofty ideal of morality not without a touch of enthusiasm. Their successors Reimar von Zweter, Heinrich Frauenlob, Hugo von Trimberg, the anonymous collection *Der Winsbecke*, and the didactic *Krieg auf der Wartburg*, a supposed tournament of poets of an earlier age, all tend to the commonplaces of 'proverbial philosophy.' This change marks a shifting in social ideals. Knighthood had become less important; knights less able, perhaps, less willing, to be patrons of song. The *Minnesingers* (q.v.) are becoming *Meistersingers* (q.v.). Nuremberg, a trading city, is to become the literary centre, and to apply to poetry the commercial and economic spirit by which it had won political recognition. Prose begins to claim a place in the sermons of Brother Berthold (d.1272), of Regensburg, the greatest orator of the century, and codes of local law, *Sachsenspiegel* and *Schwabenspiegel*, are formulated in the mother tongue.

FOURTH PERIOD (1300-1624). In Germany as in France the fourteenth century shows a shifting in political life that is reflected in literature. Its beginning is distinctively aristocratic; at its close it is as distinctively bourgeois, though artificial still. This shifting is marked by the rise of the free cities and their literary guilds and *Meistersingers*. This is the century also of the founding of the first five German universities—Prague (1348), Vienna (1365), Heidelberg (1387), Erfurt (1392), which exist to-day, and Cologne (1388), since abandoned—whose influence was more favorable to scholasticism than to literary art. Life grew more serious, more realistic. The drama is its chief field (Hans Sachs). Social and political satire is cultivated (*Reinhard der Fuchs*). Didactic poetry (Sebastian Brant) and prose narrative (*Eulenspiegel*) is often crassly realistic. The scholarship of Germany expresses itself chiefly in Latin. "This whole period, extending into the seventeenth century, produced no poetic work of art that could satisfy even elementary demands in purity of form" (Scherer).

In prose, on the other hand, the early fourteenth century counts three great preachers, Meis-

ter Eckhart (d.1328), Heinrich Suso (d.1366), and Johannes Tauler (d.1361), mystics all. Eckhart was distinguished for the boldness and originality of his speculations, Suso for his chivalrous, if not quixotic, devotion to transcendental truth, Tauler for the sanity of his sanctity. All found readers, and each in his way helped to prepare Germany for the Reformation and for Luther. Narrative prose chronicles were now written in German and lay open to all readers. The Limburg Chronicle (1336-98), the Alsace Chronicle (1386), and the Thuringian Chronicle (about 1430) have literary as well as historical significance, and suggest the gradual preparation of Germany to welcome and use the invention of printing. With it came the revival of classical studies. New universities were founded in the course of the fifteenth century at Rostock, Greifswald, Tübingen, Leipzig. The Humanists, though they wrote almost wholly in Latin, become a force to be reckoned with in German culture. The restlessness of the people under the tyranny of princes and the abuses of the Church is witnessed by swarms of little tales in prose and verse, *Volksbücher*, miracle plays, Shrove Tuesday plays (*Fastnachtsspiele*), and polemic satire, of which the most striking examples are Thomas Murner and Geiler von Kaisersberg, both popular preachers. In such a period Emperor Maximilian's (d.1519) attempt to revive the taste for romance by the autobiographic *Weiss Kunig* and by *Theuerdank* (written at his suggestion by Melchior Pfünzig) was foredoomed to failure.

The literature of the Reformation period in its intensity of purpose sacrifices all charm and grace of form. It is a literature of combat, direct, trenchant. Luther's Bible is its great monument; to it Germany owes the inestimable gift of a common speech. Ulrich von Hutten is the satirist of the Reformation in verse and dialogue, ardent, bold, an enthusiast of political and religious emancipation. He was chief among the authors of the cleverest satire of the period, the *Epistolæ Obscurorum Virorum*. Allied to Hutten in aim, but with greater scholarship, was Johannes Fischart, translator of Rabelais, with whose spirit he had a strong affinity, preferring prose to poetry as a vehicle of thought and molding words to his purpose with singular freedom. Other prose writers of the sixteenth century were the artist Dürer (q.v.), the historians Thurnmeier (d.1534), Sebastian Franck (d.1545), and the Swiss Tschudi (d.1572); the Catholic theologian Agricola (d.1566), more noted for his collection of German proverbs; the Protestant Reformer Zwingli (d.1531), and later the successors of the religious mystics, Johann Arndt (d.1621) and Jakob Boehme (d.1624).

In poetry the sturdiest figure of the Reformation period is Hans Sachs (q.v.), who, as well as Fischart, wrote secular verse also. *Reineke Fuchs* was imitated by Rollenhagen in *Der Froschmeuseler*. The drama was very widely cultivated as a means of polemic and popular appeal alike by the Catholics and Reformers, the Humanists and the vulgar. The noblest poetic expression of the time is, however, its religious lyric. Many hymns of Luther, a few of Hans Sachs, Nicolaus Hermann, Paul Ebers, and Philip Nicolai, still survive in popular use. These hymns were second only to Luther's Bible in their appeal to the national heart.

FIFTH PERIOD (from Opitz to Klopstock, 1624-1748). The recreation of literature after the Thirty Years' War was begun in the pedantic spirit of Opitz by a literary society of university men, chiefly at first in Hamburg and Leipzig. The names that emerge from the general mediocrity are those of the religious poet Gerhardt (1607-76), the novelist Grimmelshausen (1625-76), and toward its close the critic Gottsched (1700-66), whom this period leaves engaged in a controversy with the heralds of the new period, Bodmer (1698-1783) and the school of Zurich, as to whether French or English poets were the most worthy of imitation, since it was admitted that one must imitate somebody. This period closes, or rather the classical period begins, with the publication of the first cantos of Klopstock's *Messias*.

The Thirty Years' War deferred the development of the national consciousness which the Reformation had promised. For political or social aspirations the conditions were unfavorable, as they were also to the spread or even the maintenance of culture. It was natural that men of a literary cast of mind should take refuge in the consolations of pietism and should express their emotions in religious lyric. Besides Gerhardt the chief Protestant hymn-writers of the seventeenth century are Johann Rist (d.1667), Joachim Neander (d.1688), and Louise of Brandenburg, wife of the Great Elector (d.1667). The best Catholic lyricist is the Jesuit Friedrich Spee, whose work belongs to the war period, for he died in his prime in 1635.

Secular poetry either sinks into vulgarity or loses touch with the people through academic affectations. First of the pedantic academics was the *Fruchtbringende Gesellschaft*, formed on the Della Cruscan model under the patronage of Leopold of Anhalt-Dessau (1617). This found fashionable imitation, and even in bourgeois Nuremberg the *Pegnitzschäfer* displaced the ancient order of Mastersingers in popular regard. The first name-worthy poets to arise in these academic schools were Weckherlin (d.1653) and Opitz (d.1639). The appearance of the latter's prosodical treatise, *Die Deutsche Poeterey*, is sufficiently epoch-marking to form the starting-point of a period. It was the trusted guide of several generations of verse-makers. Among his followers, the Silesian School, the chief are Paul Fleming (d.1640) and Andreas Gryphius (d.1664), who extended the principles of Opitz to the drama and was first to introduce the 'regular' five-act tragedy to Germany. To the Silesian School may be reckoned also the epigrammatist Logau (d.1655) and the psalmist Joachim Rachel (d.1699). The Low German humorist Lauremberg (d.1659) may be named also, and Philip von Zesen (d.1689), who founded in Hamburg an academic literary association, *Deutschgesinnte Gesellschaft*, to cultivate linguistic purity.

The first Silesian School, the purists, was succeeded by a second, the Euphuists, or better, 'Marinists,' disciples of the extravagant Italian stylist Marini. The first impulse to this aberration came from Nuremberg and the *Pegnitzschäfer*. Its noteworthy names are Hoffmannswaldau (d.1679) and Lohenstein (d.1683). A little later French influence asserts itself, and Boileau finds disciples of his *Art poétique* in Canitz (d.1699), Besser (d.1729), and König (d.1744).

Of the prose of this period Grimmelshausen's *Simplicissimus* (1659) has almost alone asserted successfully a right to live. But beside this satirical novelist of the Thirty Years' War may be named Moscherosch (1601-69), for his imitation of the satires of Quevedo, the historians Sigmund von Birken and Gottfried Arndt, the Persian traveler Olearius, the eccentric Protestant pastor Schupp, and the priest Abraham a Sancta Clara, and the voluminous but unreadable romance writers, Buchholtz, von Ziegler, and Duke Anton Ulrich of Brunswick, to be followed by multitudinous 'Robinsonaden,' in imitation of Defoe's masterpiece.

As before the Reformation, so at the turn of the century, it is the preachers and religious, metaphysical, or pietistic thinkers who give the first promise of intellectual revival. With the pietists Spener (1635-1705) and August Hermann Francke (1663-1727) comes Leibnitz (1646-1716), the brilliantly original philosopher, who indeed wrote little in German, finding French or Latin more to his purpose. More prosaic was his disciple Wolf (1679-1754), who wrote in German, and the popularizer Thamasius (1655-1728), editor of the first German magazine and commendable for his successful agitation against the juridical persecution of witchcraft. Meantime Nature was timidly reasserting her rights in poetry in the epigrams (1697) of Wernicke, and the lyrics of Günther (1695-1723), while Brockes (1680-1747) directed the attention of his countrymen from the French to the English poets by precept and by example. He translated Thomson's *Seasons*. A revival of classical studies may also be noted, but it is to England that the literary youth of Germany is looking at the close of this Fifth Period.

SIXTH PERIOD. From the *Messias* to the death of Goethe (1748-1832). The reign of Frederick II. represents a progress in German letters and æsthetic taste that is hardly paralleled in history. When he came to the throne (1740) Herder (1744-1803), Goethe (1749-1832), Schiller (1759-1805), and Richter (1763-1825) were not yet born, Wieland (1733-1813) was a child of seven, Lessing (1729-81) a boy of eleven, Klopstock (1724-1803) a youth of sixteen, Gellert (1715-69) adolescent at twenty-five. When he died (1786) Lessing had closed his epoch-making career, Wieland, Herder, and Klopstock had passed their zenith, Goethe had completed the first period of his unchallenged mastery, and Schiller was becoming his worthy compeer. Here as in the Third Period a revival of national pride led to a revival of national literature. The Seven Years' War made Prussia a rallying-point of German national feeling, such as had not existed for centuries.

Noteworthy poets contemporary with the youth of Klopstock are the descriptive, didactic, and scientific Haller (1708-77), and the genial narrative and lyric verse-writer Hagedorn (1718-54). The Leipzig school of criticism led by Gottsched (1700-66) continued its conservative protest alike against the Anglophile school of Zurich, headed by Bodmer (1698-1783) and Breitinger (1701-76), and the amiable and popular Gellert (1715-69), chief representative of the younger writers of Leipzig. Name-worthy among the forerunners of the classical period are the satirist Rabener (1714-71), the epigrammatist Kistner (1719-1800), the essayist Cramer (1752-

1807), imitator of Steele, and C. F. Weiss (1726-1804), first to make successful literary appeal to German youth and childhood.

The new literary life is first fully felt in Gleim's (1719-1803) *Lieder eines preussischen Grenadiers* (1758). Associated with Gleim in what is known as the Halle School were Uz (1720-96) and Götze (1721-81); the literary connection with these of the poet of nature, Ewald von Kleist (1715-59), of Ramler (1725-98), a martial lyricist, of Hölz (1748-76), and of the idyllist Gessner (1730-87), is less intimate. The religious lyric tradition is meantime continued by von Zinzendorf (1700-60).

Klopstock meantime gave copious utterance to the subjectivity and sentimentalism of his generation, but did more for poetic technique than for public taste. Even his patriotic dramas and songs had value chiefly as examples and suggestions to Heinrich von Kleist (1777-1811). The whole tendency of Frederick's influence, direct and indirect, was to turn away from sentimental enthusiasm and pietistic mysticism toward realistic study and practical activity. This appears strikingly in the popular philosophic movement, which derives in part from the French encyclopædists, but more from Shaftesbury and Locke. Its leaders were Moses Mendelssohn (1729-86) and Friedrich Nicolai (1733-1811), both of Berlin, with whom it is convenient to associate Thomas Abbt (1738-66), Georg Sulzer (1702-79), and Johann Engel (1741-1802). Among the popular historians Möser (1720-94) deserves note, and in criticism Johann Winckelmann (1717-68) and Christian Gottlieb Heyne (1729-1812).

All these belong in their cast of mind to the forerunners of the classical generation. The full force of the inspiration and emancipation that came from the triumphs of Frederick II. to the German literature that he affected to despise first appears clearly in the development of the genius of Wieland (1733-1813), who in educating Duke Karl August of Weimar gave the new literature a genial home and kindly fostering. Meantime the sterner spirit of Lessing was breaking down and building up in æsthetics the drama, philosophy, and religion. The authors and scholars of Weimar and the neighboring Jena entered into his labors through Herder (1744-1803), while the young Goethe brought hither the fresh sap of the spring-tide of storm and stress to be clarified and strengthened before it was itself revived by Italian naturalism. But the effervescence is in no way confined to Weimar or to Lessing and Goethe. One feels it seething in the young Schiller, in Lenz (1751-92), Bürger (1747-94), Klinger (1752-1831), Wagner (1769-1812), Leisewitz (1752-1806), and in the multitude who thought themselves geniuses of a *Geniezeit*. Of cardinal importance to the writers and the æsthetics of the succeeding decade was Kant (1724-1804), by his *Critique of Pure Reason* (1781), who, as well as his successors, Fichte (1762-1814), Schelling (1775-1854), Hegel (1770-1831), rivaled the writers of imaginative literature in their claim on the attention of all serious minds.

With Goethe's return from Italy (1788) there comes a movement toward classicism, order, correctness, repose, or at least restraint. In inaugurating this Goethe continues the work of Lessing, and after six years wins the coöperation of

Schiller. A classical school is formed, while around these play the chartered libertines of genius, with Richter (1763-1825) as their leader, and usher in the Romantic School, whose rise and decline Goethe lived to witness. The history of this school resolves itself into a struggle to turn the objective idealism of the classicists into a subjective one, that set the imagination to overcome reality. To realistic and plastic antiquity they opposed the fantastic Middle Ages and the opulent fancies of the East. In philosophy this school substitutes the mystic or ironical idealism of Fichte and Schelling for the rationalism of Kant. The leaders here are the Schlegels (q.v.), the Brentanos (q.v.), Novalis (q.v.) (1772-1801), von Arnim (q.v.) (1781-1831), Tieck (q.v.) (1773-1853), Eichendorff (q.v.) (1788-1857), Fouqué (1777-1843), Chamisso (q.v.) (1781-1838), Hoffman (q.v.) (1776-1822), and on the borderland of the movement the dramatist Heinrich von Kleist (1777-1811), the Platonic theologian Schleiermacher (q.v.) (1768-1834), the novelist Hauff (1802-1827), the patriot-poet Uhland (q.v.) (1787-1862). Several of these outgrew their romanticism, and when Goethe died it had become more a thing of the past than even the classic realism against which it had rebelled. Heine claimed justly to be at once the last romantic lyricist and the first of the modern school. Among the lesser writers of the turn of the century there may be named the once famous idyllist and still respected translator Johann Voss (1751-1826); the poet Mathias Claudius (1740-1815); the sentimentalist Jung-Stilling (1740-1817); the lyric imitators of Schiller, Matthiessen (1767-1831) and Salis-Seewis (1762-1834); Platen (1796-1835) as master of metrical technique; the popular and prolific dramatists Iffland (1759-1814) and Kotzebue (1761-1819); the philosophical sentimentalist Friedrich Jacobi (1743-1819); Werner (1768-1823), who earned transitory fame for 'tragedies of fate,' and found imitators in Müllner (1774-1829), Houwald (1778-1845), and even the young Grillparzer (1791-1872); the patriot poets Körner (1791-1813), Arndt (1769-1860), and Rückert (1788-1866). Among the more distinguished literary scholars of the period may be named the historians Spittler (1752-1810), Johannes von Müller (1752-1809), Schlosser (1776-1861), Niebuhr (1776-1831), and von Raumer (1781-1873).

SEVENTH PERIOD. From Heine to Hauptmann (1832-1900). This period, though excluding the earlier work of Heine, embraces that which entitled him to be called 'the continuator of Goethe.' It was Heine that transferred into the political and social field the activity of Goethe in a literary one, and perceived more clearly than any other in Germany the hollowness of inherited social conditions. In an age of democratic upheaval he bore the banner of revolutionary reform, and as he grew more realistic he came more in touch with the questioning dissatisfied spirit of an age that had parted from its old ethical moorings and had not yet found a new anchorage. He was less positive therefore than Goethe, but "incomparably the most important figure of that quarter of a century that follows Goethe's death" (Matthew Arnold). His influence can be seen in almost every field, though what he wrought by lyric poetry has come to be more and more the function of the novel and of drama. The more noteworthy

poets of the generation preceding the Franco-German War and the foundation of the German Empire were: Freiligrath (1810-76); von Dingelstedt (1814-81); Kinkel (1815-82); von Redwitz (1823-91); Anastasius Grün (1816-76); Scheffel (1826-86); F. W. Weber (1813-94); Simrock (1802-76); Jordan (born 1819); Bodenstedt (1819-92); Lingg (1820—); Geibel (1815-84); Fontane (1819-98); and the composer Wagner (1813-83).

Fiction in this period shows a blending of that of Wieland, of Goethe, and of Schlegel. But from its beginnings it is, as a result of the French upheaval of 1830 and the romantic movement there, predominately social, especially after the German movement of 1848. The 'Young Germany' of 1833-35, begun by Wienburg, headed by Gutzkow, supported by Laube and Börne, was essentially political. With Heine and the women Rahel Varhagen, Bettina von Arnim, and Charlotte Stieglitz it tended to a strike for social freedom, for 'the emancipation of the flesh,' and this is strongly marked in the earlier novels of Luise Mühlbach (1814-73), Luise Ashton, Ida Frick, Ida Hahn-Hahn (1805-73), Fanny Lewald (1811-89), and in her younger days Marlitt (1825-87). These emancipationists make of the novel a political pamphlet. Though there was some reaction after 1848, fiction turning for a time from the political to the purely literary field, and to the historical novel, of which Alexis (1798-1871), Spindler (1795-1855), Laube (1806-84), and Scheffel (1826-86) were the chief representatives.

The serious drama in the period before the Franco-Prussian War is best represented by Gutzkow (1811-78), Laube (1806-84), Hebbel (1813-64), Moser (1803-67), and Heyse (1830—). Melodrama is represented by Friedrich Halm (1806-71), Charlotte Birch-Pfeiffer (1800-68), and Salomon von Mosenthal (1821-77); comedy by Freytag (1816-95) and Benedix (1811-73). The most distinguished critic of the period is Gervinus (1805-71); its best-known historians, Menzel (1798-1873), von Ewald (1803-75), and later Mommsen (1817—). Ranke (1795-1886), Droysen (1806-84), and Ernst Curtius (1814-96). The most renowned scholars of this period were the brothers Jakob (1785-1863) and Wilhelm Grimm (1786-1859). In formal philosophy its most distinguished names are Schopenhauer (1788-1860), Lotz (1817-81), Ulrici (1806-84), Ueberweg (1826-71); Schwegler (1819-57), Kuno Fischer (1824—), and von Hartmann (1842—).

In the generation following the Franco-Prussian War antiquarian fiction was cultivated by Ebers (1837-98), while the tradition of the national and political novel was continued in the work of Dahn (1834—) and Freytag (1816-95); Meyer (1825-89); Gottschall (1823—), and a numerous group of minor writers among whom Spielhagen (1829—) is chief. Romanticism is continued in Keller (1819-89), Storm (1817-88), and Marlitt (1825-87); and the naturalistic movement makes itself felt in Heyse (1830—), Wilbrandt (1837—), Sudermann (1857—), Lindau (1839—), and in its extreme form in Mauthner (1849—), Ring (1817-1901), and Kretzer (1854—); while Jensen (1837—) and Marie von Ebner-Eschenbach (1830—) represent a psychologic school, and in Lola Kirschner (1834—) and Baroness von Suttner (1843—) the social

and democratic interest is again obvious. As an offshoot of this last we have the village fiction of Auerbach (1812-82), Anzengruber (1839-89), Rosegger (1843—), and Raabe (1831—). Exotic sensation is cultivated by Franzos (1848—) and Sacher-Masoch (1836—), and urban humor by Stinde (1841—) and Eckstein (1845-1900). The most powerful writers of fiction during the period are Heyse, Dahn, and Freytag.

The patriotic lyrists of the new Empire were many. One may note Geibel and Redwitz, Becker (1828-91), and Jensen (1837—). More detached from politics are Heyse and Baumbach (1840—), and the peasant poet Johanna Ambrosius (1854—). The epic tradition is continued by Julius Wolff (1834—), and intransigent innovation in epic form is attempted by Bleibtreu (1859—), Holz (1863—), Heinrich Hart (1855—), and his more talented brother Julius (1859—).

In historical drama, besides Heyse, Wildenbruch (1845—), Greif, and Wilbrandt (1837—) were striking writers; in melodrama, Ganghofer, (1855—); and for the peasant drama, Anzengruber (1839-89). Comedy, largely French in technique and commercial in spirit, was cultivated by L'Arronge (1838—), Paul Lindau (1839—), Blumenthal (1852—), and the late-awakened genius of Moser (1825—). The greatest of modern German dramatists, democratic and somewhat socialistic in tendency, naturalistic in technique, are Sudermann (1857—) and Hauptmann (1862—), but the national patriotic drama is still best represented by Wildenbruch.

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histories are Bostwick and Harrison, *Outlines* (London, 1883); Sellss, *Critical Outline* (trans., London, 1884); Wells, *Modern German Literature* (Boston, 1895); Bossert, *Histoire de la littérature allemande* (Paris, 1901); and Robertson, *A History of German Literature* (Edinburgh, 1902). Taylor, *Studies in German Literature* (New York, 1879); and MacCallum, *Studies in High German and Low German Literature* (London, 1884), are occasionally useful.

GERMAN METHODISTS. See EVANGELICAL ASSOCIATION.

GERMAN MILTON, THE. A title occasionally given Klopstock (q.v.), author of the *Messias*.

GERMANO, jār-mā'nō, SAN. A city in South Italy, the name of which was changed in 1871 to Cassino (q.v.) (Map: Italy, H 6).

GERMAN OCEAN. See NORTH SEA.

GERMAN PLATO, THE. A name given to Friedrich Heinrich Jacobi.

GERMAN POLITICAL PARTIES. See POLITICAL PARTIES, paragraph on *Germany*.

GERMAN REFORMED CHURCH. See REFORMED CHURCH IN THE UNITED STATES, GERMAN.

GERMAN SCALE. In music, the scale of the natural notes, represented by A, H, C, D, E, F, G; not A, B, C, etc. The B is reserved for B flat, and its place is supplied by substituting the letter H.

GERMAN SEVENTH-DAY BAPTISTS. See paragraph on *Baptists, German Seventh-Day*, under BAPTISTS.

GERMAN SILVER. An alloy of copper, zinc, and nickel. It was originally made at Hildburghausen, Germany, and had the composition of copper 40.4 parts, nickel 31.6 parts, zinc 25.4 parts, and iron 2.6 parts. As this alloy came into more extensive use, different proportions of the ingredients were used. As an alloy intended to replace silver, it is made of copper 50 parts, nickel 25 parts, and zinc 25 parts. When an exceedingly malleable alloy is desired, the proportion of nickel is reduced to 20 parts, and that of zinc increased to 30 parts. A tough and malleable alloy is made of copper 60 parts, nickel 20 parts, and zinc 20 parts. German silver is harder than silver, and takes a high polish. It is used as a substitute for silver in making castings—e.g. for bells, candlesticks, and especially as a foundation for plated ware. It must, however, be remembered that German silver is readily attacked by weak acids, like vinegar, and that its use at table, unless properly coated, may give rise to poisoning. *Packfong*, an alloy made by the Chinese, is of similar composition.

GERMAN SOUTHWEST AFRICA. The oldest colony of Germany (Map: Africa, F 7). Fronting on the west coast of Africa, it is bounded by Portuguese West Africa on the north, by British South Africa on the east and south, and by the Atlantic Ocean on the west. Estimated area, 322,450 square miles. The coast-line is about 950 miles long, and almost at its middle is the British port of Walfish Bay, which with the adjacent territory (area, 430 square miles) forms a part of Cape Colony (q.v.).

TOPOGRAPHY. Three natural regions are recognized—the coastal region, the highland, and the Kalahari Waste, the western part of which is in the German territory. The coastal region is under the double influence of the cold coast waters coming partly from the south, rising partly from the ocean depths, and cooling the atmosphere to a considerable degree, and of the south-east trade winds, which, blowing from the land instead of from the sea, give the climate an almost rainless character. The coast is bordered therefore by a belt of sand about 10 miles wide, behind which rises a barren steppe from 40 to 50 miles in width. This valueless coastal zone is succeeded by the wide belt of highlands extending from north to south. The predominant features of these highlands, several hundred miles in width, are the mountains to the north of the Tropic of Capricorn, and a great tableland in the south, which is cut up by deep valleys into high plateaus. The highest elevations are among the mountains of Damaraland, where there are many summits from 3000 to 6000 feet high, the culminating point being Omatako Mountain, whose height is 8800 feet. The eastern part of the highlands slopes gradually to the Kalahari Desert (q.v.), with which they merge.

Three harbors are of commercial importance. Walfish Bay belongs to Great Britain; Angra Pequena, notwithstanding its natural advantages, is of small present value, owing to the barrenness of the surrounding country; Swakopmund (the mouth of the Swakop River) is the harbor most important for German interests, because it is through the valley of the Swakop that the highland—the valuable part of the country—may most easily be reached. The only perennial rivers are the Cunene and Kubango, on the northern boundary, and the Orange, on the southern boundary.

With a cool coast, sparse vegetation, and no standing waters, the climate, except in the extreme north, is healthful. In spite of their elevation, the highlands are warmer than the coast, and although the uplands are very dry, there are many thunder-storms in the warmer part of the year, when the stream-beds fill and the parched valleys for a short time are green with verdure.

AGRICULTURE. These elevated valleys are the only parts of its colonial possessions to which Germany is inviting its peasantry to emigrate. Many European field crops and vegetables may be grown along the streams and near the wells where the farmers procure water for their tilled lands. While the white population is still small, it is larger than in all the other German colonies together, and includes over 1000 Boers, who went to these highlands to raise cattle, because they would not live in the Transvaal under the British flag. Cattle-raising is the chief industry of the white immigrants and the natives. The comparatively low and fairly well watered lands of the extreme north (Amboiland) are tilled by the Bantu natives, but the health conditions there are not favorable for the white race.

Gold and copper are believed to exist in paying quantities, but mining is not yet developed, except to a small extent along the completed portion of the railroad now building.

The commerce of the colony is so far of small importance, and shows a far larger increase in imports than in exports. The exports, chiefly

guano from the coast, cattle, skins, hides, ivory, and ostrich feathers, increased from \$297,720 in 1897 to \$333,000 in 1901. The imports, principally foodstuffs, iron and iron products, textiles, beer, cigars, etc., increased from \$1,163,186 in 1897 to \$2,128,000 in 1901. Germany occupies the first rank with regard to the import trade of the colony, and Cape Colony the second. The trade passes chiefly through the port of Swakopmund. The transportation facilities are limited. In the interior the bull-cart is the chief means of transportation. A main road runs from north to south, and is connected with the coast. The Government railroad line from Swakopmund to Windhoek, 237 miles in length, was officially opened for general traffic on June 20, 1902. A telegraph line connects Swakopmund and Windhoek, and the former is also connected with the cable line from England to Cape Colony. A regular steamship line connects Swakopmund and Hamburg, calling on the way to and from Cape Colony. Windhoek, the seat of government, among the mountains, has the brightest prospects among all the settlements, because it is nearest to the chief port. Otavi also promises well, on account of the copper deposits near it.

The administration is in the hands of a Governor, who is assisted by district officers. The colony is divided for administrative purposes into six districts. There is a colonial army of nearly 800 men, exclusively Germans. The budget for 1901 balanced at \$2,546,600, including an Imperial contribution of \$2,213,400. The population is estimated at 200,000. The whites numbered 3639 in 1901, including 2222 Germans. The natives are sharply divided from one another by the topographic aspects of the interior. Bantu tribes (Ovambos, Herero, and others, among whom the Herero are greatest in number and political power) inhabit the mountain regions of the north, and Hottentots, or Nama, the aboriginal people of South Africa, the southern plateaus (Nama Land). The chief native tribes are the Ovambos, in the north of the colony, and the Damaras, in the central part. A sparse population of Bechuanas and Bushmen dwell on the uninviting plains of the Kalahari Desert.

HISTORY. In 1883 the German merchant Lüderitz, of Bremen, established a trading station at Angra Pequena, and secured by purchase the surrounding territory, which he named Lüderitzland, and which he ceded to the German Government in 1884. By treaties with the native chiefs the German Government obtained territorial and mining concessions in the interior, and by treaties with Portugal and Great Britain in 1886 and 1890 respectively, the northern, eastern, and southern boundaries of the colony were fixed. In 1888 the Herero chief Kamaherero of Otyimbingwe decided to revoke the mining concessions granted by him to the Germans in 1885, and as the colony was at that time practically without an army, the settlers thought it safer to leave the territory of Otyimbingwe and await reinforcements from Germany at Walvis Bay. With the arrival of troops the conquest of the interior was begun anew, and by 1898 German supremacy had been practically established over the entire territory.

Consult: Von Bülow, *Deutsch-Südwestafrika* (Berlin, 1896); Rehbock, *Deutsch-Südwestafrika, seine wirtschaftliche Erschliessung* (Berlin, 1898); Watermeyer, *Deutsch-Südwestafrika* (Ber-

lin, 1899); Hermann, *Viehzucht und Bodenkultur in Südwestafrika* (Berlin, 1900).

GERMAN THEOLOGY. As the theology of the original home and chief seat of Protestantism, and as a doctrinal system which has experienced great vicissitudes, German theology has a peculiar interest and value to the historical student.

I. **THE FOUNDATION.** The fundamental element of the Reformation was the spiritual change of regeneration, out of which sprang the conception of justification. This was 'by faith' because it had come in the midst of an experience of real and living contact with God. The Nicene foundation was retained because of the experience of the saving work of Jesus Christ, whose divine nature was thus made certain. The Augustinian anthropology was retained because it most accorded with the sense of helplessness in sin, and with the experience of divine deliverance. The preaching of Luther may be summed up as a preaching of Christ as a living Redeemer by one who claimed a personal experience of what he preached. Melancthon began the process of teaching and formulating the new theology at an early date (1520). By the year 1530 a mature and well-balanced sketch of the reformed doctrine could be prepared for presentation to the Diet of Augsburg. This 'Confession' explicitly rejects those features of the Catholic system which Protestantism (q.v.) has united in regarding as errors, and briefly gives assent to the doctrines declared to be the common basis of all Christian churches. It is distinguished by the following doctrines: justification by faith, which is 'imputed for righteousness'; obedience to God's law, not required as a condition of 'meriting justification,' but springing out of faith because God desires it; the Church, 'the congregation of saints and true believers'; two sacraments; prevenient grace; the guilt and personal origination of sin. The personal attitude of Luther toward the Scriptures was quite free. The canonicity of any book was determined by its relation to Christ. The authority of the Scriptures he rested upon the testimony of the Spirit. His views of the bondage of the will were extreme, and his doctrine of predestination absolute. By the time when the Formula of Concord was written (1576), predestination was identified with election to life alone. Thus the tendency of this theology was from life to doctrine.

II. **THE PERIOD OF FORMAL ORTHODOXY.** When the main doctrine of the new system had been determined, the attention of theologians was naturally directed from the search after new truths to the formulation and adjustment of the truths already gained, and to their defense. This was the more necessary because of the foundation of the Order of Jesuits, especially established to counteract Protestantism, among the first members of which were accomplished theologians and disputants, such as Bellarmine. Hence there arose a series of great constructive Lutheran theologians, of whom the principal were Calixtus, Calov, Johann Gerhard, Baier, Chemnitz, Hunnius, Hutten, Quenstedt. The early portion of this period was also distinguished by the production of great hymns, and by very effective evangelical preaching. But as interest concentrated upon doctrine, the religious

life began to wane. The system also underwent serious modifications. The doctrine of justification by faith lost its place as the controlling element in the system. The change may be seen in the modification of the doctrine of the Scriptures. The freedom of Luther disappears, the testimony of the Spirit is undervalued, theories of divine dictation arise, and finally the authority of the Church is sometimes declared to be enough to maintain the canonicity of a book. The immense havoc wrought by the Thirty Years' War completed the demoralization of both religion and theology.

III. THE PERIOD OF PIETISM. Some theologians had protested against the scholastic tendency of theology, but without effect. It was arrested by a remarkable revival of practical religion, which spread over Germany. This commenced through the instrumentality of Johann Arndt, who (1605-09) published, in four volumes, *True Christianity*—a book intended to arouse persons of all classes, but especially ministers and students, to practical and heartfelt religion, as well as to purify the corrupt morals of the age. It produced a powerful impression. The movement thus commenced was greatly advanced by Spener (1635-1705). He established religious meetings, called 'colleges of piety.' This name led to the movement being called pietism. It spread rapidly through Germany, and at first without excitement or opposition. But as the effect increased, popular agitation was awakened, and violent tumults arose which, beginning in Leipzig, extended through the Lutheran churches in the different States of Europe. And from this time, in all cities, towns, and villages where Lutheranism was established, there appeared suddenly persons, of various ranks and of both sexes, who declared that it was their mission to uproot iniquity, spread true religion through the world, and impart to the Church of Christ wiser rules than those which then prevailed. In their writings, in public discourses, and in private conversations they explained the means necessary for accomplishing their plans, which they proposed to do without introducing any change into the doctrine, discipline, or government of the Lutheran Church. The University of Halle, founded 1694, became the home and centre of pietism. The orphan house, established in that city by Francke, was one of its most efficient instrumentalities, because a living proof that it was able, not only to resist religious error, but also to supply the gravest wants of life. During the thirty years after the university was founded, it educated 6000 theologians. Its Oriental college prosecuted diligently the study of the biblical languages, and sent out missions to Mohammedans and Jews. From Halle the new life was diffused over Europe. The larger cities showed signs of reviving faith, and even the universities, which at first had violently opposed the movement, became its friends. Pietism was extended into Württemberg and the University of Tübingen by the labors of Bengel, the critic, exegete, and theologian of the movement, and into Moravia by those of Zinzendorf; Zurich, Basel, Bern, and many other large towns admitted it. It went as far east as the Baltic, and as far north as Norway and Sweden. Many of the Continental courts were influenced by it. The Reformed Church was awakened; England

and the Netherlands received the new movement with joy.

The movement did not fail to stir up prolonged controversy between the pietists and the theologians. Among the results of this are to be numbered the historical labors to which the mediating school turned its attention, in which Mosheim bore a leading part. Modifications of orthodoxy were also made in the direction of curtailment; the guilt of original sin was made to depend upon consent to Adam's sin; inspiration was weakened; justification was confounded with sanctification; the Trinity, incarnation, and atonement were regarded as mysteries which it was useless to attempt to comprehend. The experiential proof of Christianity was more and more abandoned, and an external, philosophic proof substituted in its place. The school of Wolf sought to demonstrate Christianity mathematically. The idea of God was derived from the light of nature; the holiness of God in the presence of guilt proved the necessity of the revelation of an atonement, if atonement is possible and capable of being known. Now it is possible, and its predicates constitute the criteria of a revelation, to which criteria the Scriptures correspond. The proof of the Scriptures was later still more externalized. The argument ran from authenticity and genuineness to historical credibility, thence to the sinlessness and miracles of Christ, which are to be credited, thence to His promise to the disciples of inspiration, and thence to the authority of the inspired Scriptures. This is an essential change from the method of the Reformation.

IV. THE INROAD OF RATIONALISM. (1) *Its incipient advance.*—In the next generation the fervor of pietism had abated. The diligent study of scriptural truth was exchanged for passive assent to it. Spener had endeavored to unite reason and faith; but his followers, renouncing reason, clung to faith alone. In this way pietism unintentionally, but really, exerted an influence against the orthodox system of doctrines by attaching great importance to the Bible alone as opposed to creeds, and to the witness of the Spirit as opposed to the written word. Zeidler, an eminent minister at Leipzig, honoring the Bible, treated systems of doctrine with contempt. Some fervent mystics, in their zeal for the 'inner word,' spoke lightly of inspiration and atonement. Some insisted simply on Christian love and morality, heedless of danger from the assaults of false teachers. Koch (1754) lamented the low esteem into which the Bible had fallen among all classes of society. This pressure against orthodox doctrine at home was strengthened by influences coming from England and Holland, the force of which may be estimated by the opposition at first made to it, as indicated by the fact that, within 40 years, nearly 90 works were published against various phases of unbelief. (2) *The period of historical criticism.*—At the middle of the eighteenth century German theology was in a rigid and shallow condition. The contest between pietism and formal orthodoxy had ceased. The second generation of professors at Halle had gone. The old defenders of orthodoxy had disappeared. Then the era of historical criticism was ushered in. New investigations were begun; antiquity, literature, science, were diligently explored; the

circle of religious beliefs was thrown open for re-examination. On this field also English deists had already been at work. In Germany, Semler of Halle led the advance, obscuring the old orthodox landmarks, assailing the text of the Bible, denying the relevancy of standard proof-texts, disputing the genuineness of many biblical books, and undermining usages and doctrines which hitherto all had received. The vigor of critical examination thus awakened spread rapidly among the universities and the clergy. It was employed on biblical criticism and exegesis, Church history, and the history of doctrine. To the authority of the Church Semler, indeed, held fast, but in a singular manner, affirming that the symbols and forms are useful in preserving external unity and uniformity. His great error was in supposing that religion can exist without a doctrinal foundation. Beginning with the warmth of pietism around him, he gradually abandoned all reverence for the Scriptures. Regarding the inner conviction of a truth-loving human heart as the only test of the inspiration of a book, he rejected Ruth, Ezra, Nehemiah, Esther, and the Canticles; questioned the genuineness of Joshua, Judges, Samuel, Kings, and Daniel; and slighted the Pentateuch as a collection of legendary fragments. The New Testament, he thought, was better than the Old, yet some of its parts he condemned as positively evil. The Apocalypse he rejected as the work of a fanatic; the Gospel of John he distinguished as the only one useful for the modern Church. He asserted that Christ and the Apostles taught many things in mere accommodation to the prejudices of the age. The doctrines of the Bible Semler vigorously attacked. What he did at Halle, other men did in different parts of Germany. Two writers, especially, carried out their principles both in their books and in their lives. Edelman constructed his theological system in answer to the question, *What is useful? not What is true?*—that is, what is seen to be useful? Consequently, beginning with very slight departures from orthodoxy, he reduced Christianity, at last, to a weak form of deism. Bahrdt went much further, ridiculing the Bible, blaspheming Christ, and, by his immoral life, making the very name of theologian infamous. Yet he stands as the turning-point of vulgar rationalism. It had become manifest that criticism, if left to itself, would produce only destruction. This compelled the search for something that would avert the fall. At the opening of the nineteenth century the Scriptures, rationally interpreted, were still regarded as teaching a rational religion. But as the historical exegesis had advanced, the chasm had widened between the traditional and the rational sense. The accommodation theory was increasingly applied to every portion of the Bible, and at length the mythical theory began to appear. Baur, in 1824, published a Hebrew mythology of the Old and New Testaments, in which the miracles were explained away as merely natural events. (3) *The connection of rationalism with philosophy.*—The work of preparation for rationalism had at first been prompted by the demands of what was called 'the sound human understanding'; but after the opening of the eighteenth century the aid of philosophy also was sought. Wolff proposed a division of theology into natural and revealed; and as natural

theology could give the reason for the facts which it affirmed, and revealed could not, emphasis was put chiefly on the former. After the decline of Wolff's popularity, the criticism of Semler and his followers seemed harmonious enough with the eclectic system which, for a time, prevailed; for both the criticism and the philosophy were in accordance with the demands of 'the sound human understanding.' But Kant's philosophy assailed both. Some of the rationalists, indeed, claimed it as favorable to them; others slighted it as unintelligible; but a few more discerning men saw that the new would overturn the old. When the speculative systems of Fichte and Schelling appeared, they despised the reasonings of 'the sound human understanding,' and slighted the best principles of rationalism as commonplace and vulgar. And rationalism, on its part, shrinking back from the new atheism, wrote strongly against it. In the faith-philosophy of Jacobi the rationalists thought they could find refuge. Their scheme hitherto had allowed no scope to sentiment and the heart. A mere probability was its highest word for the essential truths. The system of Jacobi met this difficulty, since to the intellectual probability it added the certainty of feeling. Therefore the better class of rationalists welcomed it. With this rose also the supernaturalist school, including those who denied the absolute rule of reason in matters of religion; and, though many of them were deficient in reverence for the Bible, they were at least travelers in an upward path. Hegel and his followers professed to present the pure and final rendering of that which Christianity gives in a popular form—to vindicate philosophically the Trinity, the atonement, and the other doctrines of the orthodox creed, and to refute the rationalism which had impugned these mysteries. This claim Strauss, in his life of Jesus, utterly denied. Treating the Gospels as a narrative of merely natural events, he asserted that Jesus, a devout man, impelled, like other Jews, by the preaching of John the Baptist, made confession of sin, and was baptized. Afterwards, proclaiming Himself as the promised Messiah, by His courage, activity, and purity of life, He won the good opinion of many, especially of the common people, and attached to Himself a company of devoted disciples; but having, by His scathing rebukes of hypocrisy, kindled the enmity of the priests and Pharisees, He was, by their influence, put to death on the cross. The wonderful works of beneficence and power with which the narrative was adorned were only fanciful inventions of His disciples, which ultimately came to be regarded as facts. This historical Jesus Strauss strove to transform into an ideal character, and affirmed that the God-man is to be looked for not in any one person, but in the human race as a whole. At a later period he was driven to admit for a time that the life of Jesus was extraordinary; that Jesus Himself had controlling power over the minds of men, and perhaps over physical disease; that "in Him must be recognized the highest that can be known or thought in religious things; that without Him present in the mind no complete piety is possible, so that the substance of Christianity is in Him preserved to us." But these admissions he later withdrew.

V. RETURN TO EVANGELICAL DOCTRINE. As the way for the prevalence of rationalism had been opened through the decline of practical religion, so the return to evangelical doctrine was effected by a revival of personal piety. While Semler was striving to disintegrate faith in the Scriptures, as well as the Scriptures themselves, Klopstock wrote and published his *Messiah*, which was spread over every part of Germany and among all classes, awakening admiration, and kindling devotion. About the same time, Hamann, a young German, after vainly seeking relief in folly and vice from the effects of disappointment, retired to a remote part of London, obtained a Bible, and read it carefully. With a revulsion of feeling, he entered at once on a new course. His writings and genius soon procured him friends in his own country, and gave him influence over the noble, the gifted, and the rich, by which they, as well as men of humbler life, were won to the Christian faith. Herder, contemporary with both Klopstock and Hamann, in his *Spirit of Hebrew Poetry*, gave attention particularly to the literary and human elements of the Bible as, in his opinion, strengthening its claims to a divine origin. He pointed out, critically, its poetical beauties, not as if they were ornaments only, but as springing from the heart of the revelation, and forming an essential accompaniment of inspiration. He wrote also on the New Testament, treating of the Pentecostal gift of tongues, the Resurrection, the Redeemer in the three Gospels, the Son of God as the Saviour of the world, and the spirit of Christianity. While imparting elevated views of the Scriptures, he labored also to exalt the pastor, considering that his true place was by the side of the old prophets, and that no man was worthy of the office who neglected the particular care of souls. He was himself, in many respects, a model preacher. While the three distinguished men above mentioned were in the midst of their active work, Schleiermacher was born, who has been called the greatest divine of the nineteenth century, and to whose influence for good scarcely any limit can be assigned. In his fifteenth year he was sent to a Moravian school, whence he brought a personal devotion to Christ. His *Discourses to Unbelievers of Cultivated Minds* (1799) marked at once the opening of a new century and of a new era in religion. In 1789 David Mendel was born of poor Jewish parents, his father a peddler, his mother an intelligent and pious woman. At Hamburg he was assisted in acquiring an education, and soon won the respect of teachers and scholars by his talents, while he excited also their merriment by the oddity of his appearance and the awkwardness of his manner. When Schleiermacher's *Discourses* were published, Mendel was one of the multitudes awakened by them, and in 1806, renouncing Judaism, he was baptized, and took the name Neander (a new man). He studied theology at Halle, where Schleiermacher was his favorite professor and deeply interested friend. In 1812 both teacher and pupil were made professors in the new university at Berlin, the former of theology, the latter of Church history. In this position Neander worked to the end of his life, and acquired, as a lecturer, vast renown. Even Schleiermacher's hearers were limited in number when compared with the crowds that came from all parts of Germany,

and the most distant Protestant countries, to hear Neander. Many Roman Catholics also were found in his classes. All the great preachers of Germany became more or less enlightened by his ideas. His salutary influence on the religious condition of the country was immeasurably great, powerfully contributing to the overthrow both of rationalism and of dead formalism, and drawing multitudes of young men to embrace the vital doctrines of Christianity. With him religion was nothing without Christ—not only apprehended by the intellect, but also loved and trusted with all the powers of the soul. In his view sin was not only injurious, but also involved guilt, and could be pardoned only through the death and mediation of Christ. In 1816 Tholuck entered the University of Berlin, where he was rescued from skepticism under the instructions of Schleiermacher and Neander, aided by the influence of a distinguished Moravian friend. In 1826 he became professor of theology at Halle as the successor of Professor Knapp, who had sincerely but timidly resisted the prevalent rationalism. Out of 900 students only five avowed their belief in the divinity of Christ; and all the professors, being rationalists, opposed Tholuck's appointment. But the number of young believers in Christ increased year by year. Many thousands of young men became Christians under his instructions. Hengstenberg (1802-69) devoted his youth chiefly to the study of philosophy and the Oriental languages; but, during a season of sickness and sorrow, having turned with great ardor to the spiritual teaching of the Bible, he became fully convinced of the divine authority of evangelical religion and of the excellence with which its truths are expressed in the Augsburg Confession. In 1826 he was made one of the professors of theology at Berlin, and from that time, for more than forty years, was a conspicuous and earnest defender of Christian doctrine, as based on the divine authority of the Scriptures. Among his numerous writings may be mentioned, as having especial influence: *Egypt and the Books of Moses*; *Commentary on the Psalms*; and *The Christology of the Old Testament*.

VI. THE LAST HALF OF THE NINETEENTH CENTURY. Four general schools of thought may be distinguished. The first, proceeding from the school of Schleiermacher and adhering to the 'union' (of the Reformed and Lutheran churches in Prussia), may be called an evangelical, conservative school, though in such representatives as Dörner and Rothe exhibiting a large degree of speculative independence. Dörner founded his system upon speculation rather than upon exegesis. Julius Müller was the next important member of this school. The second school is also conservative, but more consistent and compact, because rallying with distinct purpose around the historic confessions of the Lutheran Church. It rose in the circles in which the Lutheran protest against the 'union' was most vigorously made. Its chief seat became the University of Erlangen, where a series of able men defended it—Harless, Thomasius, Hoffmann, Frank, and Zahn. For a long time it was powerfully represented at Leipzig by Luthardt, Kahnis, Delitzsch, and their colleagues. Thomasius, formed by Schleiermacher, and influenced by Hegel, embraced the old Lutheran orthodoxy with great warmth and sincerity. He

sought to develop its Christology by the suggestion of the 'kenosis' (q.v.). Hoffmann was the great exegete of the school. Frank had more of the spirit of Luther than the others, and based his theology upon Christian experience, conceived as having its ultimate element in the new birth. Luthardt did not sympathize with these modifications. Delitzsch, with others, formed the 'New Lutheran' party, which laid great emphasis on the doctrine of the Church. The third school takes its rise from Baur, and has adhered in various degrees to the principles of Baur's historical criticism (Hilgenfeld), or has gone over to a substantial naturalism (Pfleiderer). It is most remarkable that, while the second school has still a large following among the pastors throughout Germany, in academic circles the three have all lost their leadership, except possibly at Erlangen alone, and have been almost everywhere replaced by the members of the fourth school, that of Ritschl (q.v.). Since about 1870 the Ritschlian school has been constantly upon the increase. Ritschl, having for a time been an adherent of Baur, finally came to occupy a position of his own, which may be summarily described as an effort to derive theology from the principle of the divine love, with such an emphasis upon the Christian life that elements of the doctrinal system not having evident connection with this should be excluded. The result is the great abridgment or total suppression of the supernatural element in Christianity and the excision of regeneration and eschatology. The preëxistence of Christ is declared to be of no 'interest,' and the Trinity becomes Sabellian. Ritschl was succeeded at Göttingen by Schultz, his colleague, and has his representatives now everywhere: at Bonn, Bender and his son Otto Ritschl; at Strassburg, H. H. Wendt; at Marburg, W. Herrmann; at Basel, Duhm. At Leipzig, Gregory, who has continued Tischendorf's work, is a Ritschlian. But the centre of the influence of the school is now Berlin, where Kaftan represents the right wing, approaching very close to evangelical standards in his *Dogmatik*, and repairing most of the defects and omissions of Ritschl; and Harnack the left wing, whose monumental historical work has given him the acknowledged first place in his department in the world. As defined by one of their own number, "the Ritschlian school is not a school, and embraces men of quite widely different styles of thinking, being united only in this, that it demands that a man shall love truth and seek that alone without fettering prejudices. All such it welcomes."

Consult: Dörner, *History of Protestant Theology* (trans., Edinburgh, 1871), which covers the whole field; Landerer, *Neueste Dogmengeschichte* (Altenburg, 1881), beginning with Semler; Frank, *Geschichte und Kritik der neueren Theologie* (Leipzig, 1898), beginning with Schleiermacher. Nippold and Pfleiderer have published valuable sketches of the theological history of the nineteenth century.

GERMAN TINDER. See AMADOU.

GERMANTOWN. A former suburb of Philadelphia, since 1845 included within the municipal limits. Germantown occupies a large area, about five miles to the north of the centre of the city. Its picturesque site, the superior character of its architecture, its beautiful gardens, and the large

public libraries, render it a charming place of residence. To the west is the romantic gorge of the Wissahickon; to the north is Chestnut Hill, with its fine villas. There is a large section occupied by manufacturing establishments. Germantown was settled in October, 1683, by a party of Germans, four of whom in 1688 made the first formal protest ever made in America against slaveholding. The first paper-mill in America was erected here in 1690, and here also, in 1743, the first American edition of the Bible, in any language, was printed. Germantown is chiefly notable in history for the battle which was fought here on October 4, 1777, between the Americans under Washington and the British and Hessians under Howe. Washington opened the engagement at daybreak on the 4th. At first his centre and left, under Sullivan and Greene respectively, forced back the opposing British and Hessians, and victory for a time seemed assured; but Stephen, on Greene's right, through a dense fog, mistook the American left centre under Wayne for the enemy, and opened fire, while a body of English, who had taken refuge in a large stone house, the residence of Judge Chew, in the rear, detained a part of the American forces. Stephen's accident, coupled with the continual firing in the rear, threw the American troops into confusion, but Washington led them from the field in perfect order. The British loss was 575; the American, 673. Washington's apparent audacity in attacking Howe so soon after the battle of Brandywine (q.v.) greatly encouraged the army and the people, and, together with Gates's success at Saratoga, led the hitherto wavering French Court to form an alliance with the United States. For a contemporary sketch of the founding of Germantown, consult: Pastorius, "Geographical Description of Pennsylvania," in *Pennsylvania Historical Society Memoirs* (Pennsylvania, 1850); for references to its early history, Scharf and Westcott, *History of Philadelphia* (Philadelphia, 1884); and for brief accounts of the battle, Carrington, *Battles of the American Revolution* (New York, 1878); Dawson, *Battles of the United States* (New York, 1858); and Lossing, *Field Book of the Revolution* (New York, 1859). For a further description of Germantown, see PHILADELPHIA.

GERMANUS, SAINT (c.378-448). Bishop of Auxerre. He was born in Auxerre, 100 miles south of Paris, of an eminent family, and became learned in literature and law and distinguished for eloquence. He was military governor of his native district, afterwards Bishop of Auxerre. On being chosen Bishop (418) he separated from his wife, built a monastery, devoted his spare property to the poor, and thereafter lived a life of the severest asceticism. He visited England twice (430 and 447) for the purpose of combating Pelagianism, and on the first occasion, shortly after Easter, 430, led the Britons against a plundering party of Picts and Scots, terrifying them into a retreat by shouting 'Alleluia,' from which circumstances the event was called the 'Alleluia victory.' It was he who discovered the future patron saint of Paris, Geneviève (q.v.). His life as told is romantic, and in part miraculous. He died at Ravenna, Italy, July 31, 448. His feast occurs on July 31st. Consult his life by Viole (Paris, 1656).

GERMAN VERSION. See BIBLE.

GERMANY. An empire which takes in the central part of Europe. The main highways between the north and south and the east and west of Europe pass through it. It is in closer touch with most of the leading nations of Europe than any other country; for it is bordered by Russia, Austria-Hungary, Switzerland, France, Belgium, the Netherlands, and Denmark, and is within a day's sail, across the North Sea, of Great Britain. Besides the land boundaries formed by the seven countries above mentioned, it has a sea frontage of 1200 miles on the North and Baltic seas—one-third of the entire frontier. The country extends east and west through 17 degrees of longitude, or 750 miles; north and south through nearly 9 degrees of latitude, 47° to 56° N., or about 600 miles. Its area is 208,830 square miles. The German Empire embraces the territory of the German Confederation of 1815-66, with the exception of those portions which belonged to Austria (in a great part of which the German language predominates), as well as of Luxemburg and Liechtenstein; but with the addition of the three Prussian provinces of East Prussia, West Prussia, and Posen (not included in the old German Empire), Schleswig, and Alsace-Lorraine. Capital, Berlin.

TOPOGRAPHY. The southern two-thirds of Germany is highland; the northern third is lowland, a part of the low plain of Europe. Three topographic forms predominate in Central Europe. The most southern is the high Alps of Switzerland. North of the high Alps are the Mittelgebirge (secondary mountains) or highlands of Germany. North of the highlands is the German low plain. The highlands consist in part of high plains, rolling or hilly areas, and, in part, of short mountain chains or groups of mountains, which extend from southwest to northeast or from southeast to northwest, seldom from south to north. Only a few summits among these mountains exceed 3500 feet in height. The mountain systems inclose high plains, as, for example, the plains of Bavaria and of the Middle Rhine basin. This division of the southern part of Germany by natural barriers was a powerful influence in separating the German people into many different States, each having its own government.

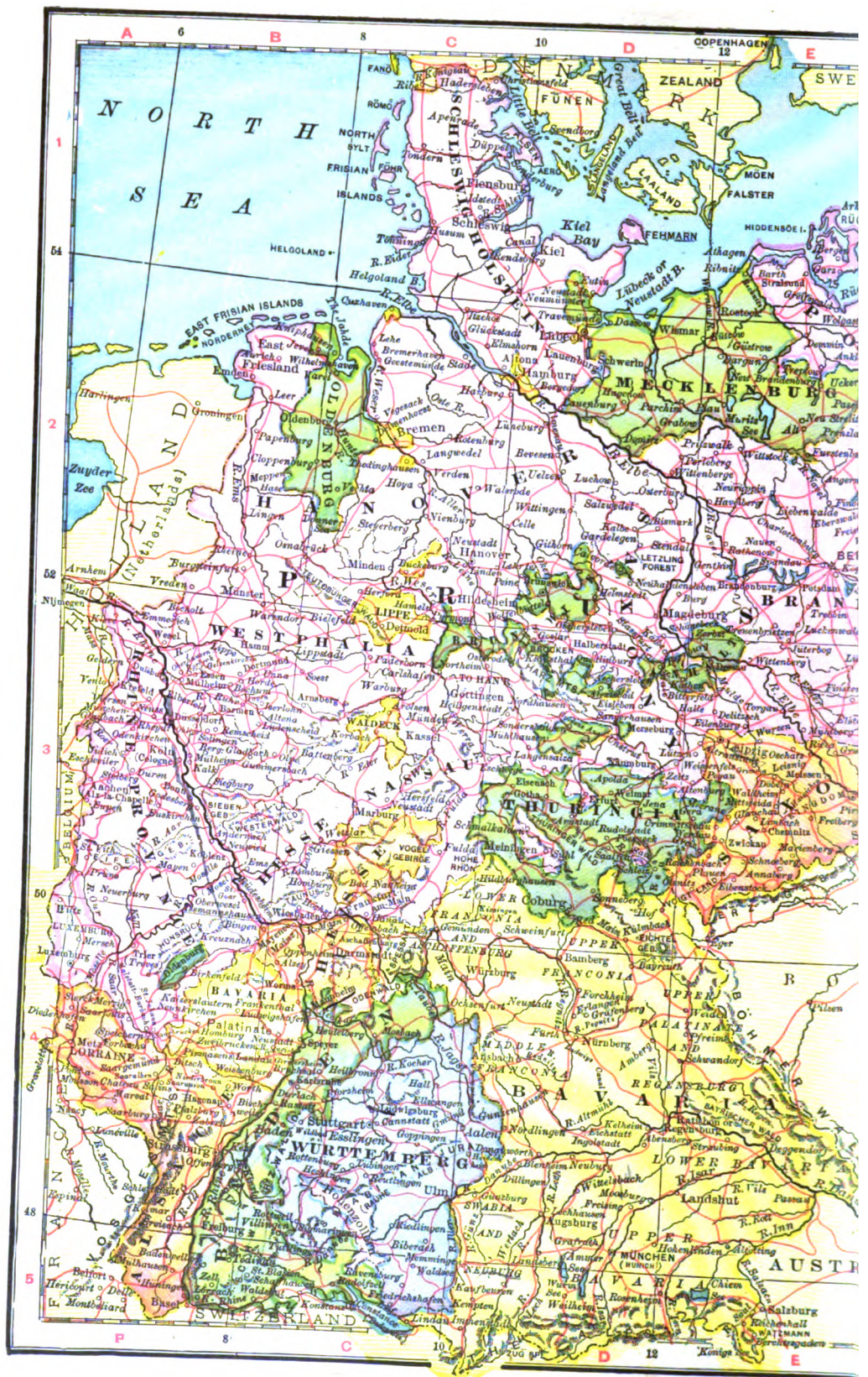
The most northern system of these mountain chains has a general east and west direction, roughly at right angles with the more southerly mountains. It extends through the middle of Germany, and forms the boundary between North and South Germany, or, in other words, between the highlands and the low plain. This zigzag boundary wall begins in the east with the Sudetic Mountains (including the Giant Mountains, or Riesengebirge), and is extended farther west by the Erzgebirge, the Fichtelgebirge, and the Thuringian Forest. The valley of the Elbe is the only break in these 390 miles of boundary mountains. Then comes the wide gap formed by the Hessian upland, broken only by the volcanic uplifts of the Rhön Mountains and the Vogelsberg. Through this break in the barrier mountains flows the Weser to the north. In the west the boundary wall rises again in the Taunus, around which is one of the finest wine regions of Germany, and, across the Rhine Valley, in the Hunsrück. Outlying elevations to the north of this wall in the

Middle Weser and Rhine basins push the highlands a little farther north in that region, and the low plain in front of them is correspondingly contracted. The culminating feature of these outliers is the Harz Mountains. The more southerly of the highlands mountains comprise among other chains or ridges the Schwarzwald, or Black Forest, the Swabian and Franconian Jura, and the Bavarian Forest. The Alps enter in the extreme south. A dominant mountain mass west of the Rhine is constituted by the Vosges. Physiographically interesting is the volcanic region, north of the Moselle, known as the Eifel. The highest point of land in the Empire is the Zugspitze, in Bavaria, 9725 feet in elevation.

In sharp contrast with the broken and divided character of the lands of South Germany is the nearly uniform low plain of the north, which merges on one side without any distinct natural boundary into the plain of Russia, and on the other into the lowlands of the Netherlands. As the course of the chief rivers shows, the whole country slopes gradually north to the Baltic, and northwest to the North Sea.

On the sea frontage there are many inlets, but few good harbors. The shore waters are quite shallow, and large vessels are usually unable to approach the land except where the rivers have worn a channel. Most of the harbors therefore are at the mouths of rivers or some distance inland on their banks. Wherever the sand-dunes along the low North Sea do not prevent the sea from breaking in, dikes have to be built for the protection of the coast. The shores of the Baltic are higher, but the commercial facilities they afford are much impaired by a series of very shallow lagoons, called Haffs, which extend parallel with the coast in front of them for long distances. The islands are not important. Rügen, in the Baltic, is the largest. Sand-dunes run along the Baltic coast in place of marsh-lands, but the North Sea dunes are now represented only by the line of the Frisian Islands, all that is left of the former coast-line, which once extended farther out into the sea. The most important North Sea ports are Hamburg, on the Elbe, and Bremen, on the Weser, together with the subsidiary ports of Bremen, Bremerhaven, and Geestemünde. The principal Baltic ports are Stettin, Danzig, Kiel, and Lübeck.

HYDROGRAPHY. With the exception of the southeastern part of Germany, through which the Danube flows to the east, all the rivers belong to the Baltic and the North Sea basins. The Rhine is the only river which binds together the three great topographic forms—the High Alps, the German highlands, and the low plain. It belongs to three countries—Switzerland, Germany, and the Netherlands. Commercially, it is the most important river in Germany, small river steamers being able to ascend to Basel, and small sea-going steamers to Mannheim. The Weser and the Elbe, the latter rising in Austria, bind together the German highlands and low plain. The Elbe is second only to the Rhine in commercial importance, being navigable throughout the whole of its course in Germany. Along its course are some of the most important silver and coal mines, salt-fields, sheep-pastures, and beet-root areas in the Empire. Besides being the greatest water commerce carrier through Central Germany from the south border to the





North Sea, it links Berlin, the capital and business centre, with Hamburg, the chief port, by the canals of the Havel and Spree river systems. The Weser is also of great importance in its lower course. The Oder and the Vistula are the chief Baltic rivers. Both rise in Austria, have only a short course in the highlands, and flow mainly through the lowland. The Oder is the great waterway of the rich mining and manufacturing district of Silesia, and of the wide farming area around Frankfort-on-the-Oder; with the canal leading to the Spree it is a highway for Berlin's commerce from Southeast Prussia to the port of Stettin. The lower part of the Vistula is German, but it carries a great deal of Russian timber, grain, and fibres to Danzig for export. Among other important streams are the Ems, flowing into the North Sea, the Main and the Moselle, affluents of the Rhine, the Pregel and Memel, flowing into the Baltic, and the Saale, an affluent of the Elbe. The rivers of Germany are naturally navigable for nearly 6000 miles; are canalized for nearly 1400 miles; and there are nearly 1500 miles of canals. Among the most important of the canals are the Ludwigskanal in Bavaria, uniting the Danube with the Main, and thus supplying a continuous waterway from the North to the Black Sea; the system connecting the Memel with the Pregel; that joining the Oder with the Elbe; the Plauen Canal, connecting the Elbe with the Havel; the Eider Canal, connecting the Eider with Kiel; the Rhine-Rhône, and the Rhine-Marne, in Alsace-Lorraine; the great Baltic Sea or Kaiser Wilhelm Canal, begun in 1887 and opened for traffic in 1895, saving two days' time by steamer between Hamburg and all the Baltic ports of Germany; and several canals in process of construction.

The lakes of Germany are chiefly in two groups, of which the smaller is in the southern section, in the Alpine Foreland. These lakes are found only in regions once covered by glacier ice, and their existence is closely connected with the ice sheet that descended from the Alps during the Great Ice Age. The larger group extends over the northern lowland, with the greatest number of lakes east of the Elbe, on the Baltic lake plain, where there are hundreds of them of glacial origin.

CLIMATE. The temperature differences between the north and the south are not so great as might be expected, because the elevation of the south is much higher than that of the north, and counteracts the effect of the difference in latitude. The differences are greater between the west and the east. The Rhine lands are the warmest and the Baltic Sea lands the coldest parts of Germany. The business of the Baltic ports is much impeded by ice in winter, while the North Sea ports are less affected by this impediment, though not quite free from it. A line drawn from Bremen to Munich divides Germany into two sections climatologically. On the west the climate is much like that of France, and mild winters and not excessively hot summers are the rule; but on the east the temperature assumes rapidly a more continental character, tempered by the close proximity to the sea at the north, but rigorous in the interior. The rainfall, owing to the nearness of the sea, is usually sufficient for all forms of agriculture. The Harz Mountains, far enough north to catch

the wet winds from the North Sea, have the heaviest rainfall. The annual rainfall is from 25 to 30 inches for most of Northern Germany, but in the extreme south and west it exceeds 30 inches. In the neighborhood of some of the mountain ranges there are local increases of precipitation to 40 inches and upward.

FLORA. In early days Germany was full of swamps and largely covered with forests. Most of the swamps have now been turned into fields and pastures; but a fourth of the Empire is still covered with forests which are cared for as assiduously as any field crop. A third of the forests are in leaf trees, the beech being most prominent. Two-thirds are in coniferous trees, particularly pines and firs. As the temperature decreases from west to east, the leaf trees predominate in the west excepting in the sandy low plain, and the conifers in the east. The crowning glory of the German flora is these wood lands.

Germany has in the north the Baltic flora and in the south the Alpine. The two mingle in the interior. The elevation of the land also has a strong influence on the local flora; so that the Alpine flora extends far to the north on the mountain tops, and the Baltic flora penetrates to the south in the valleys. Moreover, on the east the steppe flora penetrates from Russia, and on the west the West European flora penetrates from France. Upward of 2200 flowering plants, 60 cryptogams, and 750 mosses are found in German territory. In the south and west the vine grows luxuriantly and grasses flourish in the lowlands.

The best farming lands are in the warm, well-sheltered Rhine Valley, with its rich alluvial soil, where the vine is brought to an unusual degree of perfection. Many of the hill slopes throughout the highland are terraced and cultivated, but the mountains are forest-clad, and cultivation is chiefly confined to the plains and valleys. The soils differ in natural fertility, but are better than those of the low plain of the north, and all deficiencies in plain food are artificially supplied. The soil of most of the low plain is poor and sandy, particularly in the centre and east, and is kept in a state of high productivity only by scientific tillage and fertilization.

FAUNA. Germany, by its northerly situation, exposed to cold airs of the north and cut off from the south by lofty mountains, has a decidedly northern fauna, and the fastnesses of the Harz and the mountains of Bavaria, Saxony, and Silesia have preserved several wild forms extinct or nearly so elsewhere in Europe. Thus there may still be found there bears, wolves (occasionally, along the Russian border), foxes, martens, weasels, badgers, otters, and rarely a wildcat. Fallow deer are known only in a few parks, but the roe and wild boar are obtainable in many forests, and the elk still exists along the Polish border. All these, together with the Alpine chamois, are 'preserved.' The birds are those of Europe, with the absence of several semi-tropical species common south of the Alps. Most of them are migratory, and traverse the Empire along two great 'highways.' One leads to and from Africa along the Rhine-Rhône Valley, and thence east in spring and west in winter along the Baltic shore to and from Northern Russia; the other follows the Danube Valley to and from Asia Minor and India. Of the resident birds the

most remarkable is the great capercaillie of the eastern districts. Reptiles are not as well represented in Germany as in warmer and more diversified France and Italy; and the adder is nowhere common. One of its frogs, called the 'fire-bellied,' is well known. Germany shares in the fish and fisheries of the North Sea, and possesses the larger part of the south shore of the Baltic. This inland sea seems some thousands of years ago to have admitted the ocean more freely, and then, as is shown by prehistoric shell-heaps, marine fishes, oysters, and edible mollusks generally abounded in its waters. Now there are no sea fisheries of consequence in any part of the Baltic, which seems to be growing steadily shallower and fresher, with consequent alteration of its biological character. The rivers of Germany abound in fishes of large variety, among which the salmon and trout that ascend the larger streams from the Baltic are prominent. The carp family is largely represented; and the catfishes (*Siluridae*) of Germany are especially big, numerous, and edible. Insects are numerous, and bees are raised in some provinces to an extent hardly equaled elsewhere in Europe.

GEOLOGY. The surface geological formations of the northern plain are mainly Quaternary sands and clays of alluvial glacial deposit, with an occasional patch of firm Tertiary formation emerging from it. The great central highland is represented by all the formations, but is chiefly Mesozoic. On the southern border of the Quaternary plain where the highlands begin, there are in the region of the Weser highland narrow transition bands of the Cretaceous and Jura formations, which are replaced a little farther south by the great central area of Triassic rocks. On the west of the Weser highland the Quaternary formation of the north is replaced on the south by a broader Cretaceous zone, somewhat interrupted by the Quaternary, and south of the Lippe in the region of the Ruhr is a narrow belt of Dyassic and coal formation which in the Sauerland highlands is replaced by the extensive Devonian and Silurian areas of the middle Rhine, and which extends far to the westward into France. These formations are interrupted by patches of eruptive rocks and Tertiary formations, and are bordered on the south directly on the Rhine by Tertiary formations, which, however, are soon replaced by the Quaternary, which characterizes the upper middle Rhine Valley, and which interrupts the great Triassic area of Central and Southern Germany. West of the Rhine the Quaternary formations of the northern plain extend much farther south than east of the Rhine, and with progress southward are replaced, after slight interruptions, by Tertiary and Triassic formations, by the extensive Devonian and Silurian areas, which are separated from the extensive Triassic area of the south by the Dyassic and coal formations in the Oldenburg region. In the region of the Black Forest on the east and of the Vosges Mountains on the west of the Rhine Valley are extensive areas of old crystalline rocks. In the Harz Mountains the central area of Devonian and Silurian formations is surrounded by a narrow strip of Dyassic formation which on the south is replaced by the Triassic, until interrupted by the Thuringian Forest by recurring Dyassic, Devonian, and Silurian formations. The great central Triassic area is bordered on the south by the long Jurassic chain consisting

of the Swiss, Swabian, and Franconian Juras, which extend on the north side of the Rhône, the Aar, and the Danube from the Rhône to the Main. Parallel to this chain and south of the Aar and the Danube is the extended Tertiary area of the Alpine Foreland and the Chalk Alps, which is separated from the central Alpine region of old crystalline rocks by a narrow border of Jurassic formation. Germany has been glacier-covered as far south as latitude $51\frac{1}{2}^{\circ}$ in the western and $50\frac{1}{2}^{\circ}$ in the eastern part.

X MINING. The mining interests are of great importance, giving employment to over 570,000 persons annually. Germany is the third largest coal and iron producing country in the world, standing next to the United States and Great Britain. The export coal trade is steadily increasing. The total yield of the mines, exclusive of lignite, for 1900, was 109,000,000 tons, valued at \$230,000,000. Of this amount, 93 per cent. was produced in the Prussian provinces of Westphalia, Silesia, and the Rhine. About 5 per cent. came from Saxony and the remainder from Bavaria and Alsace-Lorraine. More than 16,000,000 tons, or about 15 per cent., were produced in Government mines. The steadily growing demand for fuel has greatly increased the mining of brown coal (lignite), in spite of its inferior quality, especially since the device of making it up into briquettes has enhanced its heating qualities and rendered it more convenient for storing and transportation than before. Of the total output of 40,000,000 tons of brown coal in 1900, 34,000,000 tons were produced in the Prussian provinces of Brandenburg, Saxony, and Hesse-Nassau. The following table shows the growth of the coal industry during the last three decades of the nineteenth century:

YEAR	Anthracite and Bituminous	Lignite
1871.....	29,400,000	8,500,000
1881.....	48,700,000	12,800,000
1891.....	73,718,700	20,536,600
1895.....	79,169,300	24,768,400
1900.....	109,225,000	40,279,300

The total production in the year 1900 was nearly 150,000,000 tons, as compared with 242,000,000 for the United States. The annual output of iron has been steadily growing (as the figures below will show), owing to the constantly increasing demand for raw material from the iron and steel works of Germany. The output of iron ore in 1900 was 12,793,065 tons, 4,268,069, or about one-third, of which was obtained in Prussia, and 7,742,315, or over 60 per cent., in Alsace-Lorraine. The output of iron ore in 1891 was 7,555,461 tons; in 1895, 8,436,523. Germany is rich in other ores, such as copper, zinc, lead, bismuth, nickel, cobalt, etc., the bulk of which is produced in Prussia. The quantity of gold is very small, but the silver-mines are perhaps the richest in Europe, yielding 6,243,326 troy ounces in 1900. There are large deposits of rock and other salt and an abundance of potash salts, which have contributed greatly to the development of the chemical industry in Germany. Small quantities of petroleum are found. For a more detailed description, see *Geology and Mining* under special divisions.

FISHERIES. The German fisheries are not of very great importance so far as the number of

people engaged in them is concerned. Among the fishes of Germany the most generally distributed are carp, salmon, trout, and eels. The rivers contain crayfish, pearl-bearing mussels, and leeches. Cod and herring are taken in the North Sea, and the Baltic fisheries have some value. The exports of fresh fish are insignificant. About \$18,000,000 worth of fresh fish, salted herrings, and other preserved and dried fish are imported annually.

AGRICULTURE. Germany is no longer the essentially agricultural country that it was in the middle of the nineteenth century. At that time fully 65 per cent. of the people were engaged in agriculture. In 1882 that industry supported 42 per cent. of the total population of the Empire, and but 35 per cent. in 1895. The one-third of the population engaged in agriculture is no longer able to supply the home demand, Germany having become a heavy importer of food products and raw material. Of the total area of 208,830 square miles, 86,662,721 acres, or 64.8 per cent., were devoted in 1900 to agriculture proper; 34,582,912, or 25.9 per cent., were under forests; the remaining 9.3 per cent. of the land was either unproductive or under dwellings, in streets, or used for other non-agricultural purposes. The two-thirds of the country devoted to agriculture were divided among the various branches of that industry as follows: 48.6 per cent. was under tillage, 16 per cent. under meadows and pastures, and 0.2 per cent. under vineyards.

The land is cultivated with great care and intelligence, both in the rich and fertile river valleys of the south and west as well as on the less favored plains of the north and east, and produces every variety of grain and fruit common to a moderate climate. Wheat, rye, barley, and oats are raised in all sections of the country; corn is raised exclusively in the south; while potatoes, as well as peas and beans, thrive best in the north. Flax and hemp succeed best in the middle regions; and this is also true of the oleaginous seeds, rape, poppy, and caraway. Hops, with the exception of those produced in the Prussian Province of Posen, are raised mainly in the south, in Bavaria, Württemberg, and Baden; and beet-root is grown in Prussian Saxony, Silesia, and Hanover, as well as in Brunswick and Anhalt. (For further details, see the articles on those countries.) The cultivation of cereals and potatoes is the most important branch of agriculture. Among the cereals rye predominates, holding the place in Germany that wheat does in the United States. In 1900, 14,714,738 acres were devoted to the culture of rye, as compared with 10,187,483 acres under oats, 7,953,588 acres under potatoes, 5,063,474 acres under wheat, and 4,126,652 acres under barley.

CROPS	Tons Yield 1880	Tons Yield 1895-99	Area under crops (acres), 1895-99
Rye.....	4,952,000	8,427,000	14,657,972
Wheat.....	2,059,000	3,502,000	4,779,186
Barley.....	2,076,000	2,780,000	4,069,731
Oats.....	3,700,000	6,314,000	9,886,471
Potatoes	19,400,000	35,820,000	7,600,796
Hay.....	29,142,000	23,482,000	14,588,668

Thus, while a great part of the agricultural population was diverted to manufacturing and commercial pursuits, the output of cereals was increased during the last twenty years of the century by from fifty to over one hundred per cent. Still, Germany is obliged to import increasing quantities of grain, especially wheat and corn, for its own use. Germany produces large quantities of beets, hops, and tobacco, the production of sugar-beets having made greater progress there than in any other country, the activity of the Government in granting bonuses and otherwise encouraging the industry being accountable for this growth. From 547,631 acres in 1882, the area under that crop increased to 737,742 acres in 1890, and to 1,078,752 acres in 1900, as compared with 837,669 acres in Austria-Hungary, and 630,105 in France, the next largest beet producers in the world. The principal beet-growing district extends westward from Poland to the region about Brunswick. The production of hops and tobacco is, on the other hand, on the decline. In 1891 the area under hops was 107,835 acres; in 1895 it was only 103,965 acres, and in 1900 it decreased to 91,899 acres. Similarly, the area under tobacco diminished from 59,944 acres in 1880 to 49,702 in 1890, and to 36,114 in 1900. The tobacco crop declined from 52,197 tons in 1880 to 42,372 tons in 1890, and to 30,075 tons in 1900, being valued in the last-mentioned year at about \$6,000,000. It is raised principally in the region of the Rhine and in Brandenburg. The vine is grown along the Rhine and Moselle, in the valleys of the Main and the Saale, in Lower Silesia and Swabia. The Rhine wines have a world-wide fame. Germany imports, however, double the quantity of wines that it exports.

The great increase in the productivity of German agriculture is due to improvements in methods of cultivation and the increasing use of machinery. Census investigations show that in 1882 836 farms employed steam plows; in 1895 there were 1696 such farms; similarly, the number of farms employing mowing-machines increased from 19,634 in 1882 to 35,084 in 1895; those using steam threshers increased from 75,690 to 259,364. Of the farms above 12.5 acres in area the majority used machinery. The farms were distributed as follows:

THE DISTRIBUTION OF AGRICULTURAL LAND IN GERMANY

CLASSES	Number of farms		Area under farms (acres)		Per cent. of the total
	1882	1895	1882	1895	1895
Under 5 acres.....	3,061,831	3,236,367	5,335,774	5,969,724	5.58
From 5 to 12.5 acres.....	981,407	1,016,318	9,471,101	10,263,068	9.57
From 12.5 to 50 acres.....	926,606	998,804	28,396,774	30,980,568	28.96
From 50 to 250 acres.....	281,510	281,767	30,678,609	32,511,444	30.40
250 acres or more.....	24,991	25,061	25,399,263	27,269,815	25.49

The progress of agriculture and the relative importance of the various products are shown in the following table:

The two census investigations of 1882 and 1895 have thrown much light on economic changes in the Empire during the last two decades of the

nineteenth century. In 1882 there were 5,276,344 farms and estates (including garden plots), with a total area of 99,281,521 acres, of which 78,748,230 acres were under actual cultivation. In 1895 the number of farms had increased to 5,558,317, their total area to about 106,970,000 acres, and the area under cultivation to 80,351,832 acres.

The first interesting fact brought out by the

stein, Hanover, and West Prussia; the Prussian studs have a high reputation throughout Europe. Cattle are raised chiefly in the rich marsh lands along the North Sea, and in the fertile valleys and mountain slopes of Bavaria, Württemberg, and Alsace-Lorraine. The following table shows the growth of the stock-breeding industry in the last two decades of the nineteenth century:

YEAR	Horses	Horned cattle	Sheep	Swine	Goats
1882.....	3,114,420	15,454,372	21,116,957	12,174,288	2,452,527
1895.....	3,367,298	17,063,642	12,592,870	13,562,642	3,195,251
1900.....	4,184,099	9,001,106	9,672,143	16,758,436	3,206,726

above table is the enormous proportion of extremely small farms—less than five acres each—which constitute more than 58 per cent. of the total; almost one-third of these are less than one-half of an acre each. At the other extreme are the farms and estates with an area of more than 250 acres each, which constitute less than one-half of one per cent. of the total. The farms with an area of less than five acres each, though constituting much more than one-half of the total number, cover but little more than one-twentieth of the total area. The large landowners possess about one-fourth of all the agricultural lands, leaving about three-fourths of the total area in the hands of the three classes whose farms range from five to 250 acres. As a considerable number of the owners of the fourth class are peasants, it may be said that about one-half of the agricultural land of the Empire is in their hands, the land parcels of less than five acres being owned by workmen or people of small means, who use them as garden plots. The large estates are the property of nobles and capitalists.

More than 86 per cent. of the entire agricultural land is cultivated by the owners, and less than 14 per cent. by tenants. About 41 per cent. of all the farmers cultivate their own land exclusively; a little over 31 per cent. cultivate rented land, in addition to their own; the remaining 28 per cent. cultivate rented land exclusively; the proportion of tenants has remained about the same since 1882.

The number of independent agricultural producers increased in the thirteen-year period between the two censuses about 12 per cent., from 2,283,033 in 1882 to 2,568,725 in 1895. The number of male agricultural laborers in 1895 was 3,239,640. The use of small farms as an auxiliary source of income is increasing. In 1882 3,119,825 persons, including their families, reported agriculture as a subsidiary occupation; in 1895 their number was 3,648,247, or an increase of 17 per cent.

STOCK-BREEDING. The rich meadows on the marshy plains of the north, the grassy mountain slopes and valleys of the central regions and the south, all afford excellent means for the rearing of domestic animals, making the stock-breeding industry important. The scientific cultivation of all kinds of fodder grasses has also contributed greatly to the improvement and increase of German live stock. Sheep-raising has been on the decline for several decades, owing to low prices of wool caused by Australian and Argentine competition, but is still important in Saxony, Silesia, and Brandenburg. The best breeds of horses are raised in Mecklenburg, Hol-

FORESTRY. More than 25 per cent. of the total area of Germany, viz. about 35,000,000 acres, is under forests, the preservation and cultivation of which receives almost as much attention as agriculture, and is scientifically conducted. The local supply of timber, however, does not meet the demands of the home market, and importations are necessary. The larger woods and forests in many of the States belong to the Government, and are under the care of special boards of management, which exercise the right of supervision and control over all forest land, whether public or private. More than a third of all the forests belongs to the various State Governments; about one-sixth is in the hands of the communes; 2.3 per cent. belongs to associations; a less amount to different endowments; and the remainder (about 46 per cent.) to private individuals. The States of Hesse, Baden, Bavaria, Saxony, Württemberg, and Prussia are especially rich in forests. See section on *Flora*.

MANUFACTURES. The industrial progress of Germany has been so marked in the last quarter of a century as to make that country second only in all Europe to Great Britain as a manufacturing State. In 1895 more than 20,000,000 people, or 39.1 per cent. of the entire population, as compared with 16,000,000, or 35.5 per cent., in 1882, depended directly on manufactures and mining for a livelihood. About 8,000,000 persons, as against 6,000,000 in 1882, were engaged directly in industrial establishments. The census specifies 271 distinct industries, classed in 15 large groups, whose importance according to the numbers of establishments and employees is as shown in the table on the next page.

Thus there was an increase from 1882 to 1895 of nearly 35 per cent. in the number of persons employed, while the increase in population was less than 15 per cent. during the same period. According to the number of persons engaged the most important industry is clothing, the next in order of importance being the building trades and the manufacture of foods, with over a million workers each; if we put the third (metal industry) and fourth (machine and instrument making) together, the combined metal industry ranks second only to the clothing industry; next to these and at the same time the most important feeder of the German export trade is the textile industry, which forms the oldest and most important of the German industrial arts. The chief localities for the cultivation and preparation of flax and the weaving of linen fabrics are the mountain valleys of Silesia, Lusatia, Westphalia, the Harz, and Saxony (for thread laces); while cotton fabrics are made principally

in Rhenish Prussia and Saxony. The same districts, together with Pomerania and Bavaria, manufacture the choicest woolen fabrics, including damasks and carpets. Since the formation of the Empire, the textile industries have made remarkable progress, and the German manufactures now practically hold the home market, and

Stettin, Hamburg, Bremen, and other seaports furnish a supply of merchant and navy vessels which occupy the highest place among the mercantile navies of the world for speed, durability, and model equipment. Germany is the largest beet-sugar producing country in the world, its share of the world's produce exceeding 35 per

INDUSTRY	Number of establishments, 1895	Number of persons engaged, 1895	Increase percent. in number of persons since 1882
1. Mining and smelting.....	4,164	540,388	24.7
2. Quarries and potteries.....	48,229	558,286	59.9
3. Metal industry.....	158,457	635,656	39.1
4. Machine and instrument making.....	87,879	582,672	63.6
5. Chemical industry.....	10,385	115,231	60.5
6. Manufacture of lighting material, soap and fats.....	6,191	57,909	35.6
7. Textile industry.....	205,292	993,257	9.1
8. Paper industry.....	17,631	152,909	52.7
9. Leather industry.....	47,325	160,343	31.9
10. Woodworking.....	219,914	598,496	27.4
11. Manufacture of food products.....	269,971	1,021,490	37.3
12. Clothing industry.....	848,845	1,390,604	10.4
13. Building trades.....	198,985	1,045,516	96.0
14. Printing and publishing trades.....	14,193	127,867	82.7
15. Artistic trades.....	9,511	19,879	29.2

export to South America, Australia, the East, and even to England. The growth of the cotton industry can be judged best from the increase of imports of raw cotton, which amounted to about 10,000 tons in 1840, 71,000 tons in 1871, and exceeded 313,000 tons (about 1,250,000 bales) in 1900. The silk industry and the manufacture of velvet thrive especially in Krefeld, Barmen, and Elberfeld, besides Berlin, Baden, and Aix-la-Chapelle. Great progress has been made both in the quality and the quantity of the output, although in the higher grades France still remains unexcelled.

The iron and steel manufactures of Germany are among the most important in the world. The chief seats of this industry are Westphalia and Alsace-Lorraine, the Pennsylvania of Germany; next in importance are the district of Aix-la-Chapelle, and isolated districts in Saxony, Württemberg, Bavaria, and Hanover. Iron and steel furnaces, steel-mills for the manufacture of billets, rails, bars, plates, wire, and other kinds of structural and railroad material turn out their products in enormous and constantly increasing quantities, not only for the domestic markets, but also for distant countries, in competition with Great Britain and the United States. The number of workmen thus employed increased from 164,000 in 1880 to 330,000 in 1900, or more than 100 per cent., producing 2,571,000 tons in the former year and nearly four times as much in the latter. While Germany turns out nearly all kinds of iron and steel products, it is, on the whole, behind the United States and Great Britain, both in quantity and cheapness of its products. In certain branches, however, of the iron industry, Germany excels the rest of the world. In the hardware industry, the words 'Made in Germany' branded on an article are universally accepted as a guaranty of excellence. This applies chiefly to knives, scissors, needles, weapons, and instruments of all kinds. German scientific instruments set the standard for precision and workmanship. The famous Krupp works, employing more than 40,000 workers, are the largest establishment in the world engaged in the manufacture of armor-plates, heavy artillery pieces and projectiles, boilers, engines, and all kinds of half-finished products required in their manufacturing. The shipyards of Danzig, Kiel,

cent. The principal seats of this industry are in Prussia, Brunswick, and Anhalt. The number of sugar manufactories increased from 311 in 1871 to 399 in 1900, while the output increased from 263,000 tons in 1871, when it was but little over one-half of that of France, to 1,790,000 tons in 1900, more than double the output of that country for the same year. The brewing industry is another in which Germany stands unrivaled. The best beer is made in Bavaria; numerous breweries, however, are to be found all over the Empire. Although the number of breweries has been on the decrease, 11,564 in 1880, 8969 in 1890, and 7083 in 1899, the production increased more than 100 per cent. during the same period, being 556,500,000 gallons in 1880, 848,000,000 in 1890, and 1,139,500,000 in 1900. The distilling of alcohol is also increasing, the output having risen from 78,678,500 gallons in 1880 to 97,202,000 in 1900.

In silver, gold, and jewelry work Augsburg and Nuremberg dispute with Munich and Berlin for preëminence, the manufacture of scientific and musical instruments being also important in these cities; while Berlin and Leipzig are among the leading cities of Europe in respect to type-foundries, printing, and lithography. In the manufacture of rubber and gutta-percha goods, glass and pottery ware, clocks, and carved wooden specialties, Germany occupies a leading position. The chemical industry excels that of all other countries, and the same may be said of dyeing and bleaching works. Just as the technical progress made by German industries in the last three decades of the nineteenth century can be compared only with that of the United States, so do the economic aspects of the industrial developments of Germany resemble most closely those of the United States. The chief feature in common is the growing concentration of industry. In no other country save the United States are the number and power of large industrial organizations so great. While the census does not take notice of these forms of industrial and financial organizations, it brings out other facts which illustrate the tendency toward concentration. For instance, it divides the manufacturing establishments of the country into three principal classes (besides a larger number of sub-

classes), viz. small establishments employing five persons or less; those of medium size employing from six to 50 persons; and, finally, large establishments with 50 or more employees. The following table (which includes mercantile as well as industrial establishments) illustrates the growth of each:

CLASS	Number of establishments		Number of persons employed		Increase per cent. in	
	1882	1895	1882	1895	Number of establishments	Number of persons employed
Small estab.....	2,882,768	2,934,723	4,335,822	4,770,669	1.8	10.
Medium-size estab.....	112,715	191,299	1,391,720	2,454,257	69.7	76.3
Large estab.....	9,974	18,965	1,613,247	3,044,343	90.0	88.7
Total.....	3,005,457	3,144,977	7,340,789	10,269,269	4.6	39.9

The figures show that both in the number of establishments and in number of people employed the progress was in proportion to the size of the establishments. Thus, while the total number of establishments increased less than 5 per cent., the higher group increased as much as 90 per cent., the middle group nearly 70 per cent., the lowest barely holding its own. The same tendency is observed in the number of persons employed in each group. With all that, the figures show the preponderance of small industries, the largest number of people being employed in the lowest group. Moreover, considerably more than one-half (nearly 60 per cent.) of those establishments employed no help. But while the number of persons engaged in that group constituted an absolute majority in 1882, it was only about 45 per cent. in 1895. On the other hand, the highest group, which employed between one-fourth and one-fifth of the total number of industrial workers in 1882, absorbed nearly one-third of the total number in 1895. The number of women and minors employed constituted 18.4 per cent. and 6.1 per cent. respectively of the total number of persons employed in 1895. The increased use of machinery is shown by the following figures: In 1882 only 4.7 per cent. of all the industrial establishments employed motive power outside of human labor; in 1895 the percentage rose to 5.9. The prevalence of the small house industry is shown by the fact that in the textile industry not more than 5 per cent. of all the establishments employed motive power, although that figure represented an increase of 100 per cent. as compared with 1882.

RAILWAYS. Germany has the largest railway system in Europe, the total length in 1900 exceeding 30,447 miles, as against 21,748 in the United Kingdom and 26,222 in France, its railway density being second to that of the United Kingdom. The railroad industry is among the most important in Germany, employing half a million persons and representing a capital investment of over \$3,000,000,000. The first railway built in Germany was the Ludwigsbahn, connecting the cities of Nuremberg and Fürth in Bavaria (a distance of about four miles), and opened for traffic in December, 1835. Trains began running on the Leipzig-Dresden line in 1837, and Prussia built the Berlin-Potsdam line in 1838. By 1846 only the minor States had no lines. The railways at that time were, how-

ever, distributed over the country in closely knit groups, each centring around some large city; only in the north were the lines connected. During the next thirty years railway construction was pushed with great energy, with a view to covering the old trade routes and important highways. The following table shows the growth of

railways from the year of their inception until the end of the century:

YEAR	Total length of railways	State lines. Length in miles	Private lines operated by the State	Private lines privately operated	Per cent. of State lines to total
1835	4	0	0	4	0
1840	341	29	0	312	8.5
1850	3,753	1,299	311	2,143	34.6
1860	7,241	3,247	849	43,145	44.9
1870	12,230	5,339	1,661	95,029	43.7
1880	20,627	1,040	2,634	7,591	50.4
1890	25,450	22,719	65	2,667	89.3
1895	27,428	25,013	65	2,350	91.2
1900	30,454	28,052			92.1

The table shows the growth of the railway system as a whole, and of the Government lines in particular. It will be seen that railway construction, which was pushed with great vigor until 1880, went on with a slackened pace after that year, for the great trunk lines of the country had been laid and railway-builders turned to extending the existing systems by means of branch lines to outlying territory. The other interesting fact brought out by the table is the increasing activity of the State in German railway industry. The German Empire as such does not own, however, any railways outside of the Imperial Province of Alsace-Lorraine, the rest of the State lines being owned separately by the various States. (For more detailed information on this point, see the articles on the separate countries, especially Prussia.) Attempts to put the Imperial Government in possession of the entire railway system have not been lacking, but thus far they have all failed because of the separatist sentiment, especially in the smaller southern States. The last attempt made by Bismarck in 1874, in the shape of a bill introduced in the Imperial Parliament, failed. After that the Prussians took the initiative by passing a bill in the Prussian Legislature offering to turn over their entire railway system to the Imperial Government. As the acceptance of the offer would have necessarily required a similar procedure on the part of the other German States, no action was taken. At present each of the twenty-six German States has a railway system of its own, largely owned and operated by the respective governments, a small portion remaining in private hands. Prussia is the most important railway owner; besides the Kingdom of Prussia only seven other States own more than 1000 kilometers (621 miles), their respective lengths in the closing year of the century being as follows:

Prussia, 17,990 miles; Bavaria, 4013 miles; Saxony, 1497 miles; Baden, 1081 miles; Alsace-Lorraine, 989 miles; Württemberg, 979 miles; Hesse, 705 miles; Mecklenburg-Schwerin, 700 miles. Thus Prussia controls the railway situation by holding three-fifths of the entire system, and the eight largest States of the country have more than 93 per cent. of all the railway lines.

SHIPPING AND NAVIGATION. The shipping interests of Germany are second only to those of Great Britain and the United States. In the opening year of the twentieth century the strength of the respective merchant marines of the three countries was as follows: United Kingdom, 9,395,207 tons; United States, 5,524,218 tons; Germany, 1,941,645 tons. The shipping facilities of Germany in 1901 were represented by 1390 steamers of 1,347,875 tons net tonnage, and 2493 sailing vessels, with an aggregate capacity of 573,770 tons. In 1891 there were only 941 steamers of 764,711 tons, and 2698 sailing vessels of 704,274 tons capacity, making a total of 1,468,985 tons. Thus, while the total tonnage increased about 30 per cent., that of the steamers increased more than 76 per cent., while the tonnage of the sailing vessels declined by about one-sixth of its former strength. The number of vessels entering and clearing German ports exceeded 89,000 with more than 18,000,000 tons in 1899, as compared with 10,000,000 tons in 1889, or an increase of about 80 per cent. In 1899 more than 10,000,000 tons, or over 55 per cent. of the total shipping, were carried in German bottoms, while ten years before only about 32 per cent. of the total shipping was in German hands.

The principal countries participating in the shipping of the German Empire are: Great Britain, with about 56 per cent. of the total foreign shipping of the country; Sweden, with about 12½ per cent.; Denmark, with over 11 per cent.; Norway, over 9 per cent.; the Netherlands, less than 4 per cent.; and Russia, with 3 per cent. The principal ports in the order of their importance are Hamburg, Bremen, Stettin, Danzig, Lübeck, Kiel, and Königsberg, the first of these ranking close to London and New York in the amount of its shipping. The merchant marine of the Empire employed nearly 45,000 persons in 1900—a small increase over the 40,400 persons in 1891, and 39,600 in 1881.

COMMERCE. The foreign commerce of the German Empire is subject to the regulations of the federal authorities, all of the States of the Empire together with Luxemburg joining in the so-called Zollverein or Customs Union. Absolute free trade exists between the members of the Union and a uniform tariff is applied to all goods coming to any of the States from foreign countries. In fact, the commercial regulations governing the Customs Union are exactly like those applying to the commercial relations of the individual States of the United States, and of each of those to the Federal Government, with the single exception that in the United States all customs duties collected enter the Federal Treasury to be used solely by the Federal Government, while in the German Empire the surplus over a certain sum is distributed among the members of the Customs Union in proportion to their population.

Germany is second only to Great Britain in

the volume of foreign trade. In 1901 the combined imports and exports of each of the three principal commercial countries of the world were: Great Britain, \$4,353,000,000; Germany, \$2,553,000,000; the United States, \$2,284,000,000. Unlike the United States, Germany imports more goods than it exports. In considering statistics of German commerce it is necessary to distinguish between 'general commerce,' which includes all imports and exports entering or leaving Germany, and 'special commerce,' which includes only imports from foreign countries for consumption in Germany and exports of German products. The geographical position of Germany in the middle of Europe favors a large transit trade, which swells the difference between 'general' and 'special' commerce to considerably more than a quarter of a billion dollars a year. The following table shows the growth of special commerce since the formation of the Empire:

YEAR	Imports	Exports
1872	\$824,670,000	\$593,096,000
1880	676,872,000	706,288,000
1890	1,016,974,000	811,580,000
1895	1,010,548,000	814,912,000
1897	1,157,870,000	901,068,000
1899	1,876,592,000	1,039,584,000
1900	1,438,234,000	1,131,214,000
1901	1,420,146,000	1,132,642,000

Thus the imports constitute about 56 per cent. of the total commerce and the exports 44 per cent. Owing to the enormous industrial progress in the last few decades, Germany has become an importer of foodstuffs and raw material, and an exporter of manufactured products. More than one-fourth of the total imports consist of foodstuffs and other articles of consumption; raw and manufactured textile materials, nearly two-thirds of which is raw, constitute another fourth; manufacturing metals, one-third; and metal ore, less than 8 per cent.; the remainder is made up of fuel, fertilizers, and crude chemicals, fats and oils, lumber, leather, machinery, and live animals. The principal articles of export are textiles, 20 per cent. of the total; half finished and finished metals, manufactured food products, chemicals, machines, tools, and apparatus, coal and leather goods.

The history of the commercial relations of the German Empire with other countries may be divided into three periods: (1) that of free trade, (2) the tariff period, and (3) the treaty period. During the first period, which lasted from the foundation of the Empire to 1879, there was a strong tendency to free trade, and duties so far as levied affected only a small number of articles, and that very slightly, being raised mainly for revenue purposes. In 1879 a new customs tariff went into effect as the result of prolonged agitation on the part of the joint agricultural and industrial forces, who were clamoring for the protection of home industries. That tariff has undergone numerous changes since the year of its promulgation, but the most important change—the one which marks the third period, since 1891—is that it has come to serve merely as an abstract basis for German foreign commercial relations, the real controlling factor being the tariff treaty or convention with respective foreign countries. The general tariff is called autonomous to distinguish it from the

special or treaty tariff. According to existing methods every country which has a commercial treaty with Germany—and this is the case of nearly all countries of importance—enjoys the privilege of a much lower tariff than the autonomous one, in consideration of reciprocal concessions made to German goods; but those countries which make any discrimination against German goods may be subjected to an additional tariff, which may amount to as much as 100 per cent. of the autonomous tariff on all products enumerated therein and a 20 per cent. ad valorem duty on all goods on the free list. With such a weapon in hand Germany has had little difficulty in making commercial treaties with all other nations. The growing divergence of interests between the manufacturers and the landowners has, however, made the renewal of the treaties from 1904 an extremely difficult undertaking to German statesmen. See GERMANY in the article POLITICAL PARTIES. The chief countries participating in German trade are:

three times as great in the last half of the decade 1891 to 1900 as in the first half, reaching the maximum value of \$18,776,736 in 1900. Lard, copper, and oil are the next largest items of export, the first two having increased enormously from 1890 to 1900. The phenomenal increase also in the importation of American meats and fruits has served to add fuel to the fire of German agrarian agitation against the encroachments of the United States. Grouping American exports into five large classes, the increase in the last seven years of the nineteenth century is shown as follows:

	1893	1899
1. Food products.....	\$43,000,000	\$101,000,000
2. Raw materials (cotton, timber, metals, etc.).....	39,000,000	80,000,000
3. Petroleum, lubricating oils.	12,000,000	18,000,000
4. Vegetable and animal oils..	2,000,000	6,000,000
5. Iron and iron products.....		7,000,000

(In considering the above table it should be remembered that the American trade for 1893 was below normal.)

COUNTRY	Per cent. of total imports into Germany from		COUNTRY	Per cent. of total exports from Germany to	
	1900	1890		1900	1890
1. United States.....	16.9	9.5	1. Great Britain.....	19.2	20.7
2. Great Britain.....	13.9	15.0	2. Austria-Hungary.....	10.7	10.3
3. Russia.....	12.1	12.7	3. United States.....	9.3	12.2
4. Austria-Hungary.....	12.0	14.	4. Netherlands.....	8.3	7.6
5. France.....	5.6	6.2	5. Russia.....	7.6	6.1
6. Argentina.....	3.9	1.8	6. Switzerland.....	6.2	5.3
7. British India.....	3.7	3.0	7. France.....	5.9	6.8
8. Belgium.....	3.6	7.4	8. Belgium.....	5.3	4.4
9. Netherlands.....	3.6	7.3	9. Sweden.....	2.9	2.7
10. Italy.....	3.1	8.3	10. Italy.....	2.7	2.8
11. Switzerland.....	2.8	4.1	11. Denmark.....	2.6	2.2

One of the most significant facts brought out by the above table is the preëminence of the United States in the import trade of Germany. In 1880 the United States occupied the seventh place among the countries exporting into Germany; in 1890 it moved up to the fourth, overtaking France, Belgium, and the Netherlands; in 1900 it assumed the first place, outstripping Great Britain, Austria-Hungary, and Russia. In the export trade of Germany, however, the United States occupies only third place, whereas in 1890 it occupied the second. In our own commerce Germany stands next to Great Britain, occupying the second place both in imports and exports, sending 11.4 per cent. of all our imports and taking 13.4 per cent. of our exports. But while the imports from Germany to the United States remained practically stationary throughout the closing decade of the nineteenth century, our exports to Germany increased more than 100 per cent. during that period, as the following table shows:

	Imports into Germany from the United States	Exports from Germany to the United States
1891.....	\$92,795,000	\$97,316,000
1893.....	83,579,000	96,210,000
1895.....	92,054,000	81,014,000
1897.....	125,246,000	111,211,000
1899.....	155,772,000	84,226,000
1900.....	187,348,000	97,375,000

Cotton constitutes the most important of the American exports to Germany, the annual value fluctuating greatly, with a rising tendency, the value in 1900, \$63,576,825, exceeding that of any earlier year. The annual export of corn was

The stationary state of German exports to the United States is seen from the following table of the ten principal articles sent to this country:

	1893	1899
Textiles.....	\$26,703,600	\$20,206,200
Leather and leather goods.....	4,974,200	5,569,200
Paper and paper goods.....	2,142,000	1,523,200
Books and other printed matter.....	4,641,000	3,379,600
Chemicals.....	5,331,200	9,781,800
Cement and porcelain.....	2,142,000	5,045,600
Toys.....	1,594,600	2,475,200
Machinery and other iron products	2,180,600	1,594,600
Glassware and instruments.....	1,761,200	904,400
Ornamental goods.....	856,800	1,689,800
Total of the above.....	\$52,336,200	\$52,169,600

For an account of the colonial commerce of Germany, see COLONIES, in this article.

BANKING. At the head of the German banking system is the Imperial Bank (the Reichsbank). Founded in 1875 by an act of the German Reichstag, it has been ever since the leading bank of issue, and, in addition to other banking operations, has served as the depository of the Imperial Treasury. The bank is under a stricter Government control than even the Bank of England or the Banque de France. Although practically a private stock company, its management is vested in a board of directors appointed by the Government and subject to the orders of the Chancellor of the Empire. The stockholders are represented by a general assembly, electing in turn a central committee, which makes monthly examinations of the affairs of the bank, and whose consent or advice is asked

in certain matters by the board of directors. The bank keeps on deposit all moneys intrusted to it by the Imperial Treasury, and attends to all collections and disbursements on its account without any compensation. Nor are the financial advantages derived by the Government from the operations of the bank limited to that alone. The profits of the bank are distributed as follows: First, an annual dividend of $4\frac{1}{2}$ per cent. on the capital stock of 120,000,000 marks (nearly \$29,000,000) is distributed among the stockholders; second, 20 per cent. of the remaining surplus is added to the reserve fund, so long as the latter does not exceed one-fourth of the capital stock; third, the remaining surplus is divided equally between the shareholders and the Imperial Government, but the half of the surplus is allowed the stockholders only so long as it does not raise their dividends from the above sources to more than 8 per cent. Beyond that, the surplus is divided in the proportion of one-fourth to the stockholders and three-fourths to the Government. Under that arrangement, the stockholders received a dividend of nearly 11 per cent. in 1900.

Unlike the Bank of England or the Banque de France, the Imperial Bank of Germany is not the sole bank of issue in the country. At the time of the enactment of the new bank regulations for the Empire, in 1875, thirty-one other banks were authorized to issue bank notes, the total uncovered note circulation having then been fixed at \$91,630,000, of which \$59,500,000 were allotted to the Imperial Bank, and the remainder apportioned among the rest according to their capital stock. Since then the number of these banks has gradually diminished, the allotment of the bank-note issue of all such being transferred to the Imperial Bank. In the closing year of the century only the following eight banks still retained the right of issue:

	Capital stock	Authorized note issue
Imperial Bank	\$28,560,000	\$69,829,200
Bank of Frankfurt	4,284,000	2,380,000
Bavarian Bank of Issue	1,785,000	7,616,000
Saxon Bank	7,140,000	3,991,498
Württemberg Bank of Issue	2,142,000	2,380,000
Bank of Baden	2,142,000	2,380,000
South German Bank	3,729,936	2,380,000
Bank of Brunswick	2,499,000	673,302
Total	\$52,281,936	\$91,630,000

These banks may issue notes also in excess of the allotments indicated above, but all such amounts are subject to a tax of 5 per cent. The growth of the business of the Imperial Bank from the time of its foundation may be seen from the following figures: The total amount of all kinds of transactions had increased from \$8,734,600,000 in 1876 to \$18,207,000,000 in 1886, to \$31,297,000,000 in 1896, and exceeded \$44,982,000,000 in 1900, while its loans on securities increased from \$111,146,000 in 1876 to more than \$209,440,000 in 1900.

An important business carried on by the Imperial Bank is that in connection with its clearing-house department. The latter was founded in 1883, and the volume of clearings is behind only those of the London and New York houses, exceeding \$4,760,000,000 per annum at the close of the century. Since its organization

several other clearing houses have been established in other cities of Germany, the more important being in Frankfurt, Stuttgart, Cologne, Leipzig, Dresden, Hamburg, and Bremen. In addition to the banks of issue and the branch banks mentioned above, there are about 150 other banks organized as stock companies, whose total capital stock in 1900 exceeded \$428,400,000, as compared with \$302,736,000 in 1885. That does not include the still more numerous private banks, some of which, like the Rothschilds or Bleichröder, are among the foremost banking institutions of the world. There are also several mortgage banks (*Hypothekenbanken*—*crédit foncier*) to minister to the wants of the agricultural population, people's banks (*Volksbanken*) or coöperative loan associations which lend small amounts to needy artisans and owners of workshops, and finally the Prussian Maritime Association, for a description of which, as well as of the most important Berlin banks, the reader is referred to the paragraph on Banking, under PRUSSIA.

GOVERNMENT. In 1815 the Congress of Vienna, which met to reorganize Europe after the Napoleonic wars, formed the thirty-nine component States of Germany (kingdoms, duchies, free cities, and principalities) into a confederation or *Bund*, leaving to each its complete autonomy except in a few matters of common concern. Its only organ of government was a Diet (*Bundestag*), composed of ambassadors from the several members of the Confederation, who voted according to instructions given by their governments. Almost the only powers of the Diet were to declare foreign war and make peace, organize the Federal force made up of the various contingents, and settle interstate disputes. To Austria belonged the presidency of the Confederation, in which she had a predominating influence. As time passed the feeble government of the Confederation fell more and more into disrepute. In 1848 the Liberals throughout Germany united in a revolutionary movement to overthrow the Confederation, and establish in its stead a closer and more efficient union of the German States; and although they failed in this particular, their uprising led to the establishment of constitutional government generally throughout Germany between 1848 and 1851. The war of 1866 between Prussia and Austria was followed by the dissolution of the Confederation. Prussia drew about her the States of North Germany, and formed the North German Confederation, the connection of Austria with the Germanic body being severed, while the States south of the Main concluded offensive and defensive alliances with the new Confederation. The war with France in 1870-71 consummated the union of all the German States into an empire.

The Constitution of the Empire bears the date of April 16, 1871. It is a written instrument, and enumerates with considerable detail the powers and relations of the different organs of government. It may be amended by the Imperial Legislature, according to the usual processes of legislation, except that fourteen negative votes in the Federal Council will defeat an amendment, and that those provisions which guarantee specific rights to individual States are unamendable. The empire which this, the new Constitution, created, consists of four kingdoms, six grand duchies, five duchies, seven principalities, three free cities,

and one territory, all under the presidency of the King of Prussia, who bears the title of German Emperor (art. ii.). It is not, however, a union of equals, for some of the States refused to join except upon their own terms. It thus happens that certain members enjoy specific privileges which do not belong to others. Of these, Prussia is the most highly favored. She has the hereditary right to the presidency of the Union; her representation in the Federal Council is large enough to prevent changes in the Constitution without her consent; she has the casting vote in case of a tie in the Federal Council, and the chairmanship of all the standing committees except one in that body. Among the States upon whom special privileges were bestowed as inducement to enter the Union are Bavaria, Württemberg, and Baden. They are all exempt from Imperial excises on domestic liquors and beer, while Bavaria and Württemberg have their own postal and telegraph systems, and, with certain restrictions, their own military systems. Bavaria, moreover, is exempt from the operation of the Imperial laws for the regulation of railroads except for purposes of military defense, and from the Imperial law of residence and settlement. Bavaria, Württemberg, and Saxony are entitled to seats in the standing committees of the Federal Council on Foreign Affairs and on Army and Fortifications, the chairmanship of the first mentioned committee belonging to Bavaria. The Constitution contains a guarantee that no State so privileged shall be deprived of its rights without its consent (art. lxxviii.). The German Imperial Government may be described as a federal representative system, containing democratic and elective elements on the one hand, and monarchic and hereditary elements on the other. Its federal feature is shown in the constitutional division of the powers of government between the Central Government and the State Governments, and the marking out of a sphere of activity for each. The elective and democratic elements appear in the structure of the Reichstag or National Diet, while the presidency of the Empire furnishes the monarchic and hereditary features. In regard to the methods of governing, the Imperial rule is not parliamentary in the sense of parliamentary government in England, as there is no provision for a responsible Ministry.

For the purposes of legislation the Constitution provides for a National Parliament, the Reichstag, representing the nation as a whole, and the Federal Council, or Bundesrat, representing the individual States. The latter is, to a certain extent, modeled after the old Diet of the Confederation. It is composed of delegates chosen by the governments of the several States that compose the Empire. They are without definite tenure, and are apportioned without much regard to population, but according to the artificial plan of the old Confederation. The Constitution fixes the number of votes in the Federal Council at fifty-eight, of which Prussia has seventeen, Bavaria six, Saxony and Württemberg four each, Baden and Hesse three each, Brunswick and Mecklenburg-Schwerin two each, and the other States one each. The members have the character of ambassadors, and are entitled to the same privileges that are accorded the diplomatic representatives of foreign States. They vote according to instructions from their governments,

and uninstructed votes are not counted. In case a State has more than one vote, the delegation from the State must vote as a unit, but the entire vote to which the State is entitled may be cast by a portion of its representatives. It is left to each State to prescribe the qualifications of its representatives in the Federal Council. The Imperial Constitution and the statutes, however, prescribe a number of disqualifications, most of which relate to the holding of other incompatible offices at the same time.

The Reichstag consists of representatives chosen for a term of five years by direct universal suffrage and secret ballot. By universal suffrage is meant the suffrage of all male citizens who have attained the age of twenty-five years. Those who are in active military or naval service, those who are subject to guardianship, or who are bankrupt or insolvent, or in receipt of poor relief, or condemned to the loss of civil or political rights are disqualified from the exercise of the suffrage. There are at present 397 members of the Diet, and they are distributed among the States on the basis of one representative to every 131,600 of the population. Of these Prussia has 236, or about three-fifths of the whole number. They are chosen by single district ticket, receive no pay, and are uninstructed. No qualifications are provided by the Constitution for membership in the Diet, but by statute the qualifications are fixed at citizenship for a year previous to the election, male sex, and completion of the twenty-fifth year. The constitutional privileges of members consist in exemption from arrest except by consent of the Diet unless the member be taken in the act, exemption from legal responsibility for words spoken in the Diet, and immunity from insult. In addition to these, members of the Federal Council enjoy the privilege of extritoriality, and have the right to champion the measures of their governments in the Reichstag. The power of calling, opening, adjourning, and proroguing both the Diet and the Federal Council and of dissolving the Diet (with the consent of the Federal Council) is a prerogative of the Emperor. He must, however, call them annually, and in case of a dissolution of the Diet he is bound to order the elections within sixty days, and call the new Diet together within ninety days. The Diet, moreover, cannot be adjourned without its consent more than once during the same session or for a longer period than thirty days. The Constitution fixes the quorum of the Diet at a majority, while the presence of the Imperial Chancellor in the Federal Council seems to be sufficient to enable it to proceed with business. The Diet is the judge of the elections and qualifications of its members, and has power over its own internal organization and procedure, except that its sessions must be public. There are constitutional limitations, however, on the power of the Federal Council in this respect; for the president is designated by the Constitution, and the membership of some of its important standing committees is determined by the same authority. So far as the initiation of legislative measures is concerned, the two representative bodies are theoretically on an equality. In the Federal Council each government represented may introduce measures, and it is made the constitutional duty of the president to submit them to deliberation. In the Diet the

initiation of measures is regulated by a rule of the House.

Unlike the French Parliament, the powers of the German Imperial Legislature are enumerated in the Constitution. They include the ratification of treaties, the regulation of foreign and interstate commerce, with certain exceptions in the case of Bavaria and Württemberg; the regulation of the monetary system; the regulation of the criminal law, private law and judicial organization and procedure throughout the Empire; the regulation of citizenship, medical and veterinary practice; the regulation of the customs and the excise upon tobacco, salt, spirituous liquors, beer, sugar, etc.; the regulation of the military and naval systems; the enactment of measures for the execution of the laws; and the settlement of constitutional conflicts within a State in certain contingencies. It will be seen from the enumeration that the power of the German Legislature extends to many subjects which in other States having the federal system of government are left to the regulation of the individual States. As a general thing the power of the Imperial Legislature over these subjects is not exclusive, but they may be regulated by the States in the absence of Imperial legislation. Moreover, in the domain of interstate and foreign relations, the individual States may conclude treaties among themselves for the regulation of their postal and telegraph communication, and even with foreign countries for the regulation of matters of local concern, and to that end may send and receive ambassadors.

The Imperial executive power is vested in the King of Prussia, who is president of the Union, and who bears the title of German Emperor (art. ii.). The succession is regulated by the Prussian Constitution, which makes the crown hereditary in the male branch of the royal house by right of primogeniture and agnatic lineal succession. During the minority of the King the regency is held by the nearest agnate; or, if there be no such agnate, then the Diet shall choose a regent. The King attains his majority at eighteen, and is irresponsible and inviolable. As Emperor he is vested with the power of appointing and receiving ambassadors, other public ministers, and consuls; of negotiating treaties; of waging defensive war, and with the consent of the Federal Council, offensive war; of commanding the army and navy; of promulgating the laws and supervising their execution. His powers in legislation have already been enumerated in another connection. In promulgating the laws he seems to have the power to determine whether they have been constitutionally enacted, and to refuse promulgation if in his opinion they have not; but otherwise he has no veto on Imperial legislation. In supervising the execution of the Imperial laws, which are, for the most part, administered by the State governments at their own expense, he addresses himself, through the Chancellor, to the State executives; and in case of their refusal to carry out the Imperial will, resort is had to federal execution—that is, force is brought to bear upon the recalcitrant State (art. xix.). In the enforcement of the laws, however, for the collection of the Imperial taxes and for the regulation of postal and telegraphic administration, the Emperor does not rely upon the States, but acts through Imperial officials. He appoints all the officials in the Imperial ser-

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vice, and may dismiss them. There is an exception, however, in the case of the Imperial judicial officers, who are appointed by the Emperor upon the nomination of the Federal Council, and who cannot be removed by the Emperor. In addition to these powers, which belong to the president of the Federal Union as Emperor, he has a series of important functions as King of Prussia.

The Constitution requires that all the official acts of the Emperor except those which relate to the command of the army shall be countersigned by an officer called the Imperial Chancellor, appointed by the Emperor and removable at his pleasure (art. xvii.). By this act the Chancellor assumes responsibility for the measure, thus insuring the irresponsibility of the Emperor. The Chancellor's responsibility, however, is not to the Legislature, but to the Emperor, for the parliamentary system of government does not exist in the Empire. If, therefore, the Diet refuses to pass his measures or votes a resolution of censure against him, he does not resign, but continues to hold his office, and if he thinks the action of the Diet is not the will of the people he may request the Emperor to dissolve it and order a new election. He is president of the Federal Council, and has a seat in the Diet, where he appears as the chief defender of the policy of the Government and the champion of its measures. He is also the head of the Imperial administration, and supervises in the name of the Emperor the execution of the Imperial laws. To aid him there are at present eleven departments of administration, each under the control of a secretary. They are not his colleagues, but his subordinates; for there is no Imperial Cabinet in the sense in which the term is usually understood. A law of 1878 authorizes the Chancellor to appoint a responsible Vice-Chancellor to aid him when, from pressure of business or other cause, he is unable to discharge his duties. It should also be noted that another important organ of administration is the Federal Council; in fact, the German commentators on the Imperial Constitution treat it as an organ of administration rather than as a chamber of the Legislature. Its most important administrative functions are the formulation of rules for the guidance of the administration, the preparation of the ordinances necessary for the execution of the laws, the issuing of decrees for the coercion of recalcitrant States of the Empire, and a wide participation in the appointment of Imperial officials. Under the last head may be mentioned the nomination of the judges of the Supreme Court of the Empire (*Reichsgericht*) and the election of the members of the Imperial Court of Accounts.

When we turn to the judicial system of the Empire we find few provisions in the Constitution which bear upon the subject—no provision for a Supreme Court or inferior courts, no apportionment of judicial power between the Empire on the one hand and the States on the other, according to the federal system of government, and no guarantees of judicial procedure such as constitute so notable a feature in the Constitution of the United States. The only judicial tribunal in the Empire which has a constitutional basis is the Federal Council, which is designated as a court for the settlement of public-law controversies between States and of constitutional conflicts within States, in both cases when ap-

pealed to by one of the parties. With these exceptions everything relating to the organization, jurisdiction, and procedure of the German courts is left to the regulation of the Legislature, thus making the judicial system a purely statutory creation. It was not until 1877 that the Imperial Legislature passed an act for the organization of the courts (*Gerichtsverfassungsgesetz*). At the same time Imperial codes of civil and criminal procedure were completed and, with the Imperial Judiciary Act for the organization of the courts, went into effect October 1, 1879. An Imperial code of criminal law was completed in 1870, and revised in 1871 and 1876, and more recently (1900) an Imperial civil code was put in force.

The result of all this legislation was the creation for the Empire of a uniform system of courts organized upon Imperial plan, and applying the law, which is not uniform throughout the Empire, according to a uniform system of procedure, an achievement which has done much to bring about the unification of the German States. The Imperial Judiciary Act of 1877 created a system of courts of four grades, the lowest being the district court (*Amtsgerichte*). This is a court of first instance for the trial of petty civil and criminal cases. When hearing civil cases, the court is held by a single judge; in criminal cases the judge associates with himself two laymen called *Schöffen*. At present there are over 1900 such courts in the Empire. Next above the districts courts are the territorial courts (*Landesgerichte*) consisting of from three to five judges, and divided into civil and criminal chambers. They hear appeals from the lower courts, and have a more extensive original jurisdiction in civil and criminal matters. For the trial of important criminal cases jury courts are constituted periodically in connection with the territorial courts. They consist of a bench of three judges and twelve jurors. At present there are over 170 *Landesgerichte* in the Empire. Next in the hierarchy are the superior courts (*Oberlandesgerichte*), likewise divided into civil and criminal senates, the usual number of judges in a criminal senate being seven. They have no original jurisdiction, being exclusively courts of appeal from the territorial courts. At present there are 28 superior courts in the Empire, 15 of which are in Prussia. As a result of a special provision Bavaria alone has an *Oberstes Landesgericht* of 15 judges, which has its seat at Munich. Standing at the top of the judicial hierarchy is the Imperial Court (*Reichsgericht*), which has its seat at Leipzig in Saxony. It is composed of four criminal senates and six civil senates, with an aggregate membership of over 90 judges. The judges are appointed by the Emperor, upon the nomination of the Federal Council. Their tenure is for life, and they are irremovable by any authority except the court itself acting as a disciplinary tribunal. The Imperial Court has no original jurisdiction in civil matters. Its appellate jurisdiction in civil matters extends to cases appealed from the Superior Courts, the Consular Courts, and the Imperial Patent Office Administrative Court. The criminal jurisdiction of the Imperial Court extends in first and last instance to all cases of high treason against the Emperor or the Empire, to appeals in certain cases from the decisions of the territorial courts

and the jury courts, and to appeals from decisions of the Consular Courts.

† The position of the judiciary is one of absolute independence of the administration. The judges can neither be removed, transferred to less desirable judicial stations, nor retired on pension against their will. All the judges (except those of the Imperial Court), about 8000 in number, are appointed and paid by the governments of the States in which they discharge their functions, and they are regarded as State judges, although their positions are created by Imperial law, and their qualifications and duties are prescribed by the same authority.

The Germans, like the French, from whom they have borrowed many legal institutions, have attempted to separate the spheres of justice and administration, and have accordingly intrusted the decisions of administrative controversies, not to the regular judicial courts, as is done in the United States and England, but to special tribunals called administrative courts, composed partly of trained jurists and partly of active administrators. The judges of the German administrative courts, unlike those of France, however, have a position of independence, and cannot be removed at the pleasure of the Emperor, by whom they are appointed. The most important Imperial administrative courts are the poor-law board, the railway court, the patent-office court, and the marine office. If conflicts of jurisdiction occur between the administrative and judicial courts, the proper forum is determined by the Imperial Court, there being no provision for a tribunal of conflicts as in France.

Finally, it should be said that there is little or no Imperial local government in Germany, since the Imperial laws are, for the most part, administered by the State Governments under the supervision of the Emperor. The chief local administrative activity of the Empire, therefore, consists of such supervisory service as may be necessary to insure the strict enforcement of the Imperial laws by the State authorities. For local government in Germany, see PRUSSIA.

FINANCES. The finances of the Empire resemble, in a general way, those of the United States in that they embrace comparatively few items of revenue and expenditure. The Imperial Government cannot levy any taxes except customs and excise duties. The bulk of its revenues is, therefore, derived from these two sources. Excise duties are levied on tobacco, beer, liquors, salt, and sugar. The post and telegraph, both of which are owned and operated by the Government, the railways of Alsace-Lorraine, and stamp-taxes bring in some additional revenue, which is, however, insufficient to cover the expenditures of the Empire. The deficit is covered by contributions from the several States called 'Matricular Beiträge,' and levied on each State in proportion to its population. Prussia is assessed more than 60 per cent. of the entire Federal contribution.

The chief items of expenditure are those for the army and navy, which together absorb more than a third of the entire expenditure. The Imperial treasury spends another third of the budget, and for the service of the debt of the Empire stands the next largest item, exceeding \$20,944,000 per annum, or more than 4½ per cent. of the budget. The growth of the budget of

the Empire from its foundation is shown in the following table:

YEAR	Budget	State contributions
1872.....	\$83,530,860	\$23,002,224
1882.....	141,217,776	24,582,782
1892.....	266,303,198	77,762,692
1900.....	520,362,010	116,609,062
1902.....	559,238,596	136,882,054

The total funded debt of the Empire amounted to \$547,043,000 in the closing year of the nineteenth century. Of this, \$295,120,000 bears $3\frac{1}{2}$ per cent. interest, and the remaining portion 3 per cent. The first loan raised by the Imperial Government was for more than \$3,808,000 in 1877. The growth of the debt since then has been as follows: 1880, \$51,897,804; 1890, \$266,079,716; 1900, \$547,043,000. In addition to the funded debt, there is an interest-bearing debt of \$28,560,000 in the form of treasury bills of denominations smaller than 100 marks.

NATIONAL DEFENSE. All able-bodied men are liable to military service between the ages of seventeen and forty-five years. Three years' active service is required of cavalymen and artillerymen and two years of others, the enlistment generally being at the age of twenty. Students passing a State examination may have the term of active service reduced to one year. The German military force is divided into four armies (Prussia, Bavaria, Saxony, and Württemberg), but there is a uniform plan of organization and administration. In the three States last named each king has a limited power of appointment, and the King of Bavaria of administration. (For particulars concerning the organization of the army, see article on **ARMIES**.) In 1901 the rank and file of the German army, including special officers, amounted to 580,023 men; while the officers numbered 24,145. The greatest war strength of the army is estimated at over 3,000,000 men. Service in the navy instead of the army may be made obligatory upon the maritime population. Numerous additions have been made to the German navy in recent years, giving Germany great strength as a naval power. See **NAVIES**.

Germany is particularly well fortified on the side looking toward France. In this section are situated the strong fortresses of Metz, Strassburg, Ulm, Rastatt, Mainz, Cologne, and Coblenz, and the minor fortifications of Diedenhofen, Saarlouis, New Breisach, Germersheim, Ingolstadt, Hamm, and Wesel. The other large German fortresses are in Eastern or Central Prussia, namely Danzig, Königsberg, Posen, Küstrin, Sandau, Magdeburg, and Neisse. The minor fortresses in the interior are Thorn, Dirschau, Glogau, Glatz, and Königstein. On the coast toward the north are the fortifications of Wilhelmshafen, Kiel, Friedrichsort, Cuxhaven, Geesdemünde, Sonderburg, Stralsund, Swinemünde, Pillau, and Memel.

MONEY, WEIGHT, AND MEASURES. Gold is the single standard of value, silver being legal tender only for amounts not exceeding 20 marks (less than five dollars). The coining of money is in the hands of the Imperial Government. The standard unit is the mark, equal to $24\frac{1}{4}$ cents United States gold money. The mark has one hundred pfennigs. The old thaler is equivalent to three marks. The prevailing coins are the gold

5, 10 and 20 mark pieces, called the half-crown, crown, and double crown respectively; the silver 1, 2 and 5 mark pieces; and bronze coins of smaller denominations.

The metric system has been in vogue since 1872.

COLONIES. The colonies and dependencies of the German Empire comprise German East Africa, German Southwest Africa, Kamerun, Togo, part of New Guinea (Kaiser Wilhelm's Land), the Bismarck Archipelago, part of the Solomon Islands, the Caroline Islands, the Ladrões (Marianne Islands), the Marshall Islands, part of the Samoan Islands, and Kiaochau (on the Chinese coast). The total area is estimated at a little over 1,000,000 square miles, and the population at about 12,000,000. The German colonial system is that of a pure absolutism administered through a centralized bureaucracy. Neither the natives nor the white inhabitants of the colonies have any voice in the fiscal or political administration of the territories. The laws for the colonies are framed by the Imperial Parliament, and German citizens residing in the colonies enjoy the same civil rights as in the mother country. The natives are not regarded as German citizens, but are allowed to acquire citizenship by naturalization in accordance with the general laws regulating such procedure. A fundamental law in respect to the administration of colonies was laid down by the Reichstag in 1886, and subsequently amended in 1887 and 1888. The only exception, whereby the native element is recognized in the administration of colonial affairs, is in the case of some of the districts where it was thought advisable to placate the native chiefs by making them the medium of communication between the Imperial Government and the native population.

The decision as to the budget for the colonies is nominally vested in the Emperor, though virtually it is in the hands of the Governor of the colony and his immediate subordinates. The revenue is derived from taxation, sale or lease of public property, fees, and subventions from the home Government. Direct taxes form as yet but a small item in the revenues; but having been recently introduced, they will, no doubt, yield a greater share in the near future. A house tax has recently been established, applicable both to Europeans and natives. The rate of the tax is expressed in money, but the natives are allowed to offer produce or labor as the equivalent of the tax. The determination of the value of labor and natural products is left, however, to the local authorities, thus permitting the exercise of a good deal of arbitrary power by the colonial officers. Moreover, "measures are provided for the enforcement of the tax, and for this purpose forced labor is permitted." Experience has shown that the system is productive of excessive hardships for the natives, and affords opportunity for the display of great cruelty by the local officers. The revenues derived from the various sources in the colonies are far, however, from being sufficient to cover the necessary expenses, and the home Government finds it necessary to grant large subventions from year to year. Thus, the amounts allowed by the Reichstag for the expenses of colonial administration increased from \$2,261,000 in 1896-97 to over \$7,378,000 in 1901. As will be seen from the following table, the Government sub-

vention forms about 58 per cent. of the revenue in Kamerun; 61 per cent. in Togo; 87 per cent. in New Guinea:

	Imperial subvention		Colonial revenue	
	1894-95	1901	1894-95	1901
German East Africa.....	\$802,060	\$1,693,846	\$511,700	\$1,245,216
German Southwest Africa.....	238,000	2,231,964	6,426	521,300
Kamerun.....	.....	521,934	145,418	379,848
Togo.....	.....	210,392	44,268	134,232
New Guinea.....	.....	168,742	.....	23,800
Kiao-chau.....	.....	2,558,500	.....	71,400
Caroline and Ladrone.....	.....	68,068	.....	5,950

COLONIAL COMMERCE. In 1899, out of a total of \$8,364,986 of imports brought into the German colonies, Germany contributed \$3,754,212, or less than 45 per cent., while of the total exports from the colonies, valued at \$3,620,932, Germany took \$1,198,330, or one-third. As the total amount granted in subventions by the Imperial Government was near \$7,872,000, it will be seen to have exceeded the value of the total colonial trade of Germany. If we take into account the fact that the greater part of German imports into the colonies represents supplies sent there by the Government for the use of its troops, officials, and public works, the value of the German colonial trade becomes insignificant. Thus the colonial system does not seem to have proved commercially profitable, but rather a burden.

POPULATION. The population of the German Empire numbered 56,367,178 in December, 1900, distributed among the several States of the Empire as follows:

STATES OF THE EMPIRE	Area square miles	Population 1880	Population 1900	Population per square mile, 1900
Prussia.....	134,622	29,957,367	34,472,509	256.1
Bavaria.....	29,282	5,584,982	6,176,057	210.9
Württemberg.....	7,528	2,036,522	2,169,480	288.2
Baden.....	5,821	1,657,867	1,867,944	320.9
Saxony.....	5,787	3,502,684	4,202,216	726.1
Mecklenburg-Schwerin.....	5,135	578,342	607,770	118.3
Hesse.....	2,965	992,883	1,119,893	377.7
Oldenburg.....	2,479	364,968	399,180	161.0
Brunswick.....	1,424	403,773	464,333	326.0
Saxe-Weimar.....	1,388	326,091	362,873	261.4
Mecklenburg-Strelitz.....	1,131	97,978	102,602	90.7
Saxe-Meiningen.....	953	223,832	250,731	263.0
Anhalt.....	906	271,963	316,085	348.8
Saxe-Coburg-Gotha.....	755	206,513	229,550	304.0
Saxe-Altenburg.....	511	170,864	194,914	381.4
Lippe.....	469	128,405	138,952	296.2
Waldeck.....	432	57,281	57,918	133.9
Schwarzburg-Rudolstadt.....	363	85,863	93,059	256.3
Schwarzburg-Sondershausen.....	333	75,510	80,898	242.3
Reuss Younger Line.....	319	119,811	139,210	436.3
Schaumburg-Lippe.....	131	39,163	43,132	329.3
Reuss Elder Line.....	122	62,754	68,396	559.7
Hamburg.....	158	622,530	768,349	862.9
Lübeck.....	115	76,485	96,775	841.5
Bremen.....	99	180,443	224,882	2,271.5
Alsace-Lorraine.....	5,600	1,603,506	1,719,470	306.7
Total.....	208,830	49,428,470	56,367,178	269.9

Thus there was an increase of 6,938,708 people in the last decade of the century, equal to 14 per cent.; the increase for the United States for the same period having been 20.7 per cent. Germany ranks next to Russia in population among

the countries of Europe. The growth of the population of the German Empire since its formation has been as follows: 1871, 41,058,804;

1880, 45,234,061; 1890, 49,428,470; 1900, 56,367,178.

The number of inhabitants to the square mile in 1900 was 270. The density varies greatly in different sections of the Empire, being lowest in agricultural Mecklenburg-Strelitz, 90.7 per square mile; and highest in industrial Saxony, 743.4 per square mile.

GROWTH OF CITIES. The increase in the density of population is, to a great extent, due to the increase in the number and size of cities. One-half of the people lived in towns of more than 2000 population in 1895. In 1900 there were 33 cities with a population of more than 100,000 each, as compared with 28 such cities in 1890. The German census divides the cities of the Empire into four groups of large, medium, small, and country towns, the respective populations of which are 100,000 and over; 20,000 to 100,000; 5000 to 20,000; and 2000 to 5000 people. The increase in the number of cities in each group and the proportion of the total population contained in each at various times since the foundation of the Empire are as follows:

	Year	Number of towns	Total population
Towns with a population of 2,000 to 5,000.....	1871	1,716	12.4%
	1890	1,997	12.0
	1895	2,068	12.2
Towns with a population of 5,000 to 20,000.....	1871	529	11.9
	1890	733	13.1
	1895	796	13.6
Towns with a population of 20,000 to 100,000.....	1871	75	7.7
	1890	135	9.8
	1895	150	10.4
Towns with a population of more than 100,000.....	1871	8	4.8
	1890	26	12.1
	1895	28	13.6
Urban population.....	1871	2,328	36.1
	1890	2,891	47.0
	1895	3,042	49.9
Rural population.....	1871	.....	63.9
	1890	.....	63.0
	1895	.....	60.1

The figures show a marked decline in the rural population, which constituted nearly two-thirds of the total population in 1871, and was less than one-half at the opening of the twentieth century. The table following shows the fourteen largest German cities, each having a population exceeding 200,000, according to the census of 1900.

SEX AND CONJUGAL CONDITIONS. In Germany, as in most other civilized countries, the number of females exceeds that of males, although more boys are born every year than girls. The fact being explained by the greater mortality and emigration among men. In 1900 there were 27,-

	1900	1880
Berlin.....	1,888,326	1,122,330
Hamburg.....	705,738	410,127
Munich.....	499,959	230,023
Leipzig.....	465,089	149,081
Breslau.....	422,738	273,912
Dresden.....	395,349	220,818
Cologne.....	372,229	144,772
Frankfort.....	288,489	136,819
Nuremberg.....	261,022	99,519
Hanover.....	235,666	122,843
Magdeburg.....	229,663	97,539
Düsseldorf.....	213,767	95,458
Stettin.....	210,680	91,756
Chemnitz.....	206,584	96,123

731,067 men and 28,613,947 women, the excess of women being 882,880, or 103.2 women to 100 men; the proportion of births is 106 boys to 100 girls. These proportions have remained about the same for the last few decades.

The marriage rate has remained fairly stationary since the foundation of the Empire, being 8.2 per 1000 inhabitants in 1871, 7.5 in 1881, 8 in 1895, 8.2 in 1896, 8.4 in 1897, 8.4 in 1898, 8.6 in 1899. Unlike France, Germany has an increasing surplus of births over deaths. While the birth-rate remains practically stationary, the death-rate is steadily declining, as is shown by the following table:

YEAR	Per 1,000 inhabitants		
	Birth-rate	Death-rate	Excess of births over deaths
1870	40.1	29.0	11.1
1880	39.1	27.5	11.6
1890	37.0	25.6	11.4
1895	37.3	23.4	13.9
1899	37.1	22.7	14.4

The non-German inhabitants of the Empire exceeded 4,000,000, including Poles, Czechs, Wends, Lithuanians, French, Danes, Dutch, Frisians, etc. The most numerous are the Poles (about 3,000,000), who are found exclusively in the east and northeast of Prussia (mainly in Posen and Silesia); the Czechs are found in Silesia, about Oppeln and Breslau; the Wends in Silesia, Brandenburg, and Saxony; the Lithuanians in East Prussia; the French in Alsace-Lorraine; the Danes in Schleswig. The Poles are prominent as a hostile element in the Empire. (See GERMAN LANGUAGE.) Although the Jews (570,000) are scattered over every part of Germany, they are most numerous in the Prussian territories. There were less than 500,000 foreigners residing in Germany at the end of the century; nearly half of them were citizens of Austria-Hungary.

EMIGRATION. Germany has always sent out a considerable number of people willing to seek their fortune beyond the seas. During the eighteenth and the early part of the nineteenth century Russia took great pains to attract German emigrants by granting them various privileges, giving them large tracts of land, and advancing pecuniary aid during the first years of settlement. In the nineteenth century the United States served as the chief field for the ambitious German who did not find room for advancement at home. During that century it is estimated that over 6,000,000 people emigrated from Germany. The high-water mark in the tide of emigration was reached in 1881, when nearly 221,000 Germans left the Fatherland; since that year the

number has steadily diminished, as is shown by the following figures:

YEAR	No. of emigrants	Per cent. of total population	No. of emigrants to the U.S.
1881.....	220,902	4.86	
1885.....	110,119	2.36	
1890.....	97,103	1.97	85,112
1891.....	120,089	2.41	108,611
1895.....	37,498	0.72	30,692
1900.....	22,309	0.40	19,338

The fluctuations observable are the result of increasing or decreasing prosperity at home or abroad. Nearly 90 per cent. of all the emigrants go to the United States, less than 5 per cent. to Brazil, Argentina, and other American countries, and the remainder to Australia, Africa, and Asia. There was a great drop in the emigration to the United States in the years 1893 and 1894 as a result of the commercial depression in the United States in those years.

RELIGION. Germany is generally considered a strongly Protestant nation, though the Protestant element numbers somewhat less than two thirds of the total population. The number of Protestants in 1900 was 35,231,000, or about 63 per cent., as against 20,321,000 Catholics, or about 36 per cent. The proportionate distribution of these religious bodies has changed but little since the religious wars of the seventeenth century, and is characterized by a decided grouping within definite limits, corresponding to the States, or to smaller political divisions, so that in most localities one or the other religion is strongly predominant. Some change in the relative proportions of the two sects has been effected in the large cities as a result of the movement of population, accompanying their recent growth. Central Germany is, generally speaking, the stronghold of Protestantism, and the Rhine and Danube regions of Catholicism. More than one-third of the population of Prussia consists of Roman Catholics, who are especially numerous in Posen, Silesia, Westphalia, and the Rhine Province. In Bavaria, Alsace-Lorraine, and Baden the Catholics far outnumber the Protestants. In Saxony, together with the eighteen minor States, there are only 31 Catholics per 1000 of the population, and they but little exceed this proportion throughout the greater part of Central Prussia. In Württemberg and Hesse the Catholics form nearly one-third of the population.

The Protestant Church in Germany contrasts with that of America and England in that it is not split up into numerous rival factions. The adherents of the Church are divided between the two confessions, the Lutheran and the Reformed, and the United Evangelical Church (dating from 1817, and at first established only in Prussia), formed by a union of the Lutheran and Reformed bodies under State auspices. The largest Protestant denomination outside of the Lutheran and Reformed bodies, that of the Baptists, numbers only about 30,000 members. This Evangelical Church is the most numerous body. By its latitudinarianism, the Protestant Church has retained within its fold the followers of many widely different schools of thought, from extreme orthodoxy to rationalism. At the end of the nineteenth century the tendency toward rationalism in theology, which had long been

so prominent in Germany, was apparently on the decline. In the last quarter of the century a considerable element of the laboring class in the large centres of population had become divorced from any Church through the rise of the socialistic propaganda, the defection varying in intensity from passive indifference, growing out of the belief that the Church was in league with the present political order, to a radical opposition to all religion. The Protestant body has suffered much more severely from this movement than has the Catholic, the priesthood of the latter organization having been largely successful in checking the movement through their activity in establishing Catholic organizations for laboring men. The most recent statistics show that the relative numbers of Catholics and Protestants remain very nearly constant, the slight difference in favor of the Protestants being attributable partly to the greater increase of the population in the Protestant provinces, and in part, also, to the fact that there is a greater defection of Catholics to the Protestant Church than vice versa. The seceders from the Catholic Church after the Vatican Council of 1870 assumed the name of Old Catholics, and this faction now numbers about 50,000. The Roman Catholics have concentrated their forces until they have become politically the strongest party in the Empire, and have consequently obtained certain advantageous concessions. The severe Prussian laws of 1873 directed against Ultramontaniam, by attempting especially to limit and to control Catholic education, were repealed in 1887, and religious congregations—the Jesuits excepted—existing for charitable or contemplative purposes, are allowed. The different branches of the Christian faith are subsidized by the individual States, and in some the Jews are also supported.

EDUCATION. From almost the beginning of modern times Germany has held the primacy in educational rank. It has been distinguished both for the general diffusion of knowledge and for the superiority of its specialists in the various fields of learning. Many of the names most prominent in the pedagogical world are German. As early as 1642 Weimar had enacted a compulsory educational law, and before the middle of the century other places in Germany had followed the example. At present every child in the Empire must attend school every school day in the year (usually about 42 weeks) for a period which, in most German States, extends from the ages of six to fourteen years. The law is enforced to the letter, and there are scarcely any evasions. As a consequence illiteracy has been practically eliminated.

The early movement for the improvement and extension of education was the result largely of the efforts of the Church, which had almost exclusive charge of educational matters. The first systematic educational effort dates back to the Carolingian schools attached to monasteries and cathedrals. Their methods prevailed with some modifications through the Middle Ages. By the end of the fifteenth century common schools were widespread in Germany. The ecclesiastical conflicts of the sixteenth century checked for the time educational progress, which was successfully resumed after the cessation of the religious wars. Frederick William I. of Prussia established at his own expense 400

schools for the common people; and his son, Frederick the Great, was very active in furthering educational interests. For the regulation of schools he promulgated in 1763 an order that is considered the basis of the present German system. This order fixed a period for compulsory attendance, supplemented school support from the State funds, and provided for the superintendence of schools and regulations for the selection of teachers. A law of 1794 held that all public schools and educational institutions were under the care of the State, at the same time recognizing religious instruction under the proviso that children trained in one religious faith could not be forced to take instruction in another. The educational system was revised in 1854, and again in 1872. The interest so early manifested has never been relaxed. It was estimated as early as 1840 that the pupils of Prussia numbered one-sixth of the population.

Germany has been free from the bitter religious wrangles that have characterized the educational history of France and of the United Kingdom; for it was agreed almost without question in Germany that there should be religious teaching. Schools are provided for Catholics, Protestants, and Hebrews separately, with teachers of the respective faiths; or, if conditions do not justify the establishment of separate schools, special arrangements are made separately and at the State's expense for instruction on the subject of religion. With the growth of State aid and the centralization of the school system, ecclesiastical authority has been greatly lessened, but a large per cent. of the school inspectors are still the local pastors. Ecclesiastical authorities inspect the religious instruction given in the secondary schools, but their rôle is only advisory.

The educational scheme in Germany is made to conform closely to the existing social order, and is strikingly different in arrangement from the American. The classification resulting from the recognition of religious differences has already been noted; but of still greater moment are the differences due to the distinction made between the sexes, and to the recognition of social classes. There are, therefore, decided differentiations between schools, and a disregard of coördination. There is no clear-cut line of demarcation between primary and secondary education, as in America, and such distinctions as the German recognizes do not correspond with those familiar to Americans. Of the different courses provided in Germany, each leads to a different goal, each confers certain social privileges and rank. The courses which admit to the greatest honors are guarded by their greater cost, and thus are removed beyond the reach of the lower classes.

PRIMARY EDUCATION. The schools usually referred to as primary are known as the *Volkschulen*, which provide for the entire period of compulsory attendance. In recent years tuition charges at these schools have been generally abolished. The course here does not coördinate with the courses in the higher schools which lead to social preferment, and practically none of the pupils who complete it take up the work in the secondary schools. The only further educational provision for these children—except the few selected for normal students—are the *Fortbildungsschulen* or continuation schools (which offer two or three-year courses on evenings and Sundays, and which in some States are compulsory), and

certain other technical classes. A prominent feature in the Fortbildungsschulen are manual training, industrial and trade courses—courses that are wholly omitted in the primary grades. The children who attend the Volksschulen are from the lower masses. Parents who have in view for their children careers which are reached only through the secondary schools generally send them first to schools which prepare for the higher classes, or at least remove them from the Volksschule at the end of the third or fourth year. The Vorschule—a three years' preparatory course to the secondary schools—is sometimes found in connection with those schools. The State supports no kindergarten schools. They are maintained through private agencies, and are sometimes aided by the municipality.

✓ SECONDARY EDUCATION. The secondary system is built up with little regard to the primary system. It takes its form solely with regard to the career for which it is intended to prepare. The secondary course proper begins with the fourth year of the child's school life. The selection made for the child at that time practically determines its life's work, for the different secondary courses are characterized by great rigidity—there is practically no changing from one to another. Only recently, since about 1892, has the attempt been made, on the 'Frankfurt plan,' to introduce a system making transference at certain periods possible. In the secondary school system of earlier centuries the ancient classics held a dominant position, and an extensive system of privileges admitting to social rank had been based upon them, and tended to give them a peculiar persistence. The schools in which the classics still constitute the central feature of the course are called the *Gymnasien*, and it is only by taking this course that admission may be secured to many of the highest Government positions or the highest social recognition reached. But the requirements of a practical age have demanded greater and greater concessions. An entirely different class of schools—the *Realschulen*—have grown up, in which the modern languages are the centre of the course, special attention being given to mathematics and natural sciences, without offering technical training. Schools of this nature began to be popular as early as the time of Frederick the Great, but it was not until the last half of the nineteenth century that the obstacles in their way were sufficiently removed to allow them a rapid growth. There has naturally been a development along a compromised line, as shown in the *Realgymnasien*—Latin being retained and practical subjects substituted for the Greek. And, indeed, since 1900, substitutes for Greek are accepted in the Prussian *Gymnasien*.

Secondary education, therefore, has developed along three lines represented respectively by the *Gymnasien*, *Realschulen*, and *Realgymnasien*. Each of these types embraces two classes of schools, the distinguishing feature being the length of the curriculum—generally either six or nine years. The main factor determining this time-classification is the privilege afforded, to those who have completed six years in the recognized secondary schools, of reducing the period of compulsory military service in the army to one year. The desirability of this reduction, and especially the social prestige which it implies, induce many to complete the six years, after

which they are likely to discontinue the course unless they have in view university or other advanced study, and further special privileges. Accordingly many schools give only the first six years of the course. Those which offer the full nine years are the *Gymnasien*, *Realgymnasien*, and *Oberrealschulen*, while the corresponding schools of six years are the *Progymnasien*, *Realprogymnasien*, and *Realschulen*, the *Höhere Bürgerschulen* belonging also to the latter class. Graduates from the *Oberrealschulen* are admitted to study in most of the special or technical branches given at the universities, and also in the mathematical and natural science courses; while those who have graduated from the *Realgymnasien* may take, in addition to the preceding, certain other branches, such as modern languages. The entire university course, including some of the most desirable branches like theology, law, medicine, and ancient philology and history, is open only to the graduates of the *Gymnasien*, though Prussia since 1900 has thrown open all its faculties, except theology, to graduates of the *Realgymnasien* and the *Oberrealschulen*. The relative importance of the different classes of secondary schools in Germany is seen in a statement of their number. In 1897 there were 439 *Gymnasien* and 92 *Progymnasien*; 128 *Realgymnasien* and 93 *Realprogymnasien*; 198 *Realschulen* and 4 *Oberrealschulen*, besides 2 *Höhere Bürgerschulen*, 32 other public schools, and 56 private schools.

As seen above, the secondary course of instruction is definitely planned with reference to a professional career. Since it is not intended that women should follow these careers, it is not necessary that they take these preparatory courses. Under the prevailing social and military order, the Government demands the most exacting preparation of its men for the service of the State. This consideration, which involves great expense, limits the extent of State support to female secondary education. Most of the secondary schools are limited to a nine years' course (including the *Vorschulen*) and are not recognized as secondary schools, but as *Mittelschulen*. The *Höhere Mädchenschulen*, however, are of secondary rank, although the ancient classics have no place in their curriculum, the modern languages—German, French, and English—taking their place. Very recently three schools offering courses identical with those of the boys' *Gymnasien* have been established for girls.

UNIVERSITIES. Germany has 21* universities, the largest being Berlin, with about 5500 pupils, Munich, 4500, and Leipzig, 3500 (these figures do not include non-matriculated students). The other universities, arranged in order of the number of students matriculated, are as follows: Bonn, Breslau, Freiburg, Halle, Tübingen, Heidelberg, Göttingen, Marburg, Strassburg, Würzburg, Kiel, Königsberg, Erlangen, Giessen, Greifswald, Münster, Jena, Rostock. The universities of Freiburg, Munich, Münster, and Würzburg have Roman Catholic faculties of theology; Bonn, Breslau, and Tübingen have mixed Catholic and Protestant faculties; and the other universities are all Protestant. University students are allowed an extreme degree of liberty, in striking contrast to the rigid discipline observed in the secondary schools. Indeed, the spirit of freedom pervading the university life, as evidenced especially in the great liberty

enjoyed by the university faculties in thought and speech, is an anomaly in a government so strongly military, and making itself so prominently felt in all other phases of life. The universities are of equal rank, and the entrance requirements are the same, namely: The completion of the secondary schools—admission to all university courses being secured only by completing the course at the *Gymnasien*. While the universities are in theory non-respecters of persons or social classes, they are in reality exclusive, because the expense of university life and of the secondary course preceding it tends to limit the attendance to representatives of the higher social classes.

SCHOOL ADMINISTRATION. The German States act independently in their school systems. The main important outlines of the respective systems are nevertheless almost uniform. There is much variation in details. The Prussian system is generally described as representative. The control of the Prussian schools is through the Department of Education, subject to the limitations of the Constitution and of precedent. The head of the department is a Cabinet officer, known as the Minister of Religion, Education, and Medical Affairs. The Minister is aided by a large number of special councilors. There are two divisions in the department, the first having charge mainly of the universities and the secondary schools, the second of other branches of education. In each province there is a school board, of which the president of the province is chairman. The other members are proposed by the Minister of Education and appointed by the King. This board supervises the most general matters, such as questions concerning text-books, etc., and especially matters concerning the secondary schools. The provinces are divided into 'governments,' and these again into districts, both the large and small divisions having school boards. These 'Government' school boards concern themselves more particularly with the common schools. The district board erects buildings, supervises salaries and pensions, and other local financial matters. Its principal member is the inspector, who is appointed for life. Finally there is the local school board—one for each school—exercising oversight over external matters such as repairs, supplies, etc. Local authorities have nothing to do with the internal affairs of the schools, the central authority possessing absolute control.

Germany offers ample provisions for every phase of technical instruction. There are a very large number of artisan and trade schools, also special schools for agriculture, forestry, mining, architecture, art and art-industry, and in addition nine technical high schools and polytechnics, these last two being as high in rank as the polytechnical colleges in America.

TEACHERS. No country is as particular as Germany in the selection and preparation of teachers. The teacher is an officer of the State, and enjoys a prominent social rank. He is sure of his position for life, or, after a period of service, of retirement upon a pension. However, honor is an important part of his compensation, for, especially in the primary schools, the salary is very meagre and occasions much complaint. The qualifications required of teachers are about uniform in the different States, and each recognizes the certificates granted by the others. The

process of selecting candidates for primary teaching begins with the children in the primary schools, only the most promising pupils being selected. On leaving the primary school the child takes a three years' course, especially designed for preparation for the normal school (seminary), where one year more of academic work and three years of normal work are demanded, the student, if needy, being financially assisted by the State. By limiting the number of preparatory schools, the State can prevent the creation of any serious overplus of teachers. The feature of religious devotion is prominent in the seminaries—these being either Protestant or Catholic. After finishing the seminary the candidate receives a provisional appointment and is only permanently accepted after demonstrating fitness and passing a final examination.

SCHOOL FUNDS. The method of the development of the school system has resulted in a complicated and diversified system of financial support. There are generally local taxes, which if necessary are supplemented by the State. The State fund is the largest source, supplying about one-half of the expenses, while local taxation supplies about one-fourth. The Church and Church societies are often important contributors.

CHARITIES. The different German States, except Bavaria and Alsace-Lorraine, have adopted uniform systems of poor laws, but there is no centralized system of administration. Each poor-law district provides for its own poor, a residence of two years being the requisite time to determine the place of settlement, although relief may be given by the local authorities of the district in which the individual has temporary residence, to be recovered from the community in which the settlement of the individual is fixed. The distinction between public and private charity is not closely drawn.

The Empire has played a very important part in providing for the welfare of the masses and thus checking the possibility of destitution, through the establishment of compulsory insurance against accident, sickness, and old age. None of the other leading nations have made provisions of so comprehensive a nature for the benefit of the laboring classes. Insurance against sickness, the first step taken, was first secured in 1883, followed in 1884 by the insurance against accident, and in 1889 against old age. Numerous benefit societies conducting insurance features, already in existence, were recognized by the Government, and allowed to act as agents in lieu of those appointed by the State, which subjected all such organizations to a uniform system and control. The division of administration necessitates an increased expenditure, and an attempt has been made to centralize the entire administration of the system in the hands of the State. In the insurance against sickness, two-thirds of the premium is contributed by the workmen and one-third by the employer. In the insurance against accident, the employer class is responsible for the burden of contribution, but the relief to the injured laboring man is taken from the sick-fund for the first thirteen weeks, and it is only after the expiration of that period that the employer class becomes liable. Insurance against old age is obligatory upon all laborers whose wages do not exceed 2000 marks a year. The premium paid is divided evenly between the laborer and the employer. The re-

ceipt of the pension begins when the one insured reaches the age of seventy. The insurance scheme has stood the test to the satisfaction of both employer and employed. In 1898 the insurance against sickness included over 9,233,000 workmen, while the accident insurance included 18,246,000 persons, and 512,000 received old-age annuities.

HISTORY.

The history of Germany may be said to begin with the year 843, when, by the Treaty of Verdun, the vast Empire of Charles the Great was divided into three parts among his grandsons. (For the earlier periods, see *GERMANIA*; *FRANKS*; *CHARLES THE GREAT*; *CAROLINGIANS*, etc.) In the partition of Verdun, Louis the German (843-76) received the eastern portion of the Frankish Empire, which included the purely Germanic peoples. Until 911 legitimate or illegitimate Carolingians held the throne, but their power was comparatively little, and depended almost wholly on their strength in their own possessions. Instead of a united Germany, there were several great German duchies—Swabia, Bavaria, Franconia, Saxony, and sometimes Lotharingia or Lorraine. The last, however, was debatable territory; independent at first, it later was connected with its stronger neighbor, Germany or France, as the case might be. At first the Franconians and Saxons were the strongest nations, and supplied the rulers of the German Kingdom. Charles the Fat (876-87), son of Louis the German, succeeded for a brief time (about 884-87) in reuniting the old Frankish lands under his sway, but they fell apart again after his death, and Germany was ruled by Arnulf till 899. The last Carolingian King, Louis the Child, died in 911, and the German princes elected as his successor Conrad of Franconia (911-18). His reign was a constant struggle to maintain his position against his own nobles, while at the same time he had to contend against the Hungarian invaders. Just before his death he sent the insignia of royalty to his most dangerous subject, Henry the Saxon (919-36), and the latter was chosen King by the Franks and Saxons. After six years of fighting and negotiations, Henry the Fowler (as he was popularly known) was recognized by the Swabians and Bavarians also. Under him for the first time it is possible to speak of a united Germany. He made his power respected by repulsing the invaders who had been devastating the eastern and northern portions of the German duchies. The Slavs and Danes were defeated, Lorraine was conquered, and finally, in 933, a great victory was won on the Unstrut over the Hungarians. His son Otto I. (936-73) succeeded to a strong kingdom. At the coronation banquet he was served by the dukes of Lorraine, Franconia, Swabia, and Bavaria. Otto restricted the power of the dukes, checked renewed invasions of the Hungarians, defeating them decisively at the Lech in 955, and organized an efficient administrative system. In 951 he was called to Italy to aid one of the contending factions there; in 961, after wresting Northern Italy from Berengar II., a descendant of Charles the Great, he was crowned King of the Lombards, and in 962 he received the Imperial crown at the hands of the Pope, thus becoming the founder of the Holy Roman Empire of the German Nation, which existed till 1806. (See *HOLY*

ROMAN EMPIRE.) By his coronation Italy and Germany became associated for long centuries to come. The results were in some ways disastrous to both countries, but at the time Otto, as Emperor, was the great power in Western Europe. In order to strengthen his position, he negotiated a marriage for his son with the daughter of the Byzantine Emperor. Otto II. (973-83) died at the age of twenty-eight, and left an heir of three, Otto III. (983-1002). In consequence of the extent to which the Imperial power was enlisted in the affairs of Italy at this time, weakness and disunion were bred in Germany. Henry II. (1002-24) left Italy to itself for some years, and devoted his reign to strengthening the power of the King of Germany. He reformed the Church, and employed its officials in the service of the State. He repressed private wars, and won the support of the nobles by giving them greater privileges. He was the last King of the Saxon House.

Conrad the Franconian, or Salic (1024-39), was an able ruler, who added the dominions of the Arletan realm (see *BURGUNDY*) to the Empire. His son and successor, Henry III. (1039-56), extended the boundaries of Germany on the side of Hungary, repressed the insolence and despotism of the temporal and spiritual princes of Germany, and gained the respect of his contemporaries by his zeal for justice and his valor in the field. The minority of his son and successor, Henry IV. (1056-1106), enabled the nobles to recover much of their former power, and to apply a check to the further consolidation of the Imperial authority, which had been considerably extended during the two preceding reigns. Henry's constant quarrels with Pope Gregory VII. entangled him in difficulties and mortifications which ended only with his life, and which plunged Germany into anarchy and disorder. (See *INVESTITURE*.) With his son and successor, Henry V. (1106-25), the male line of the Franconian Dynasty became extinct, and after the crown had been worn (1125-37) by Lothair of Saxony, Conrad III., Duke of Franconia, inaugurated the Hohenstaufen Dynasty. His reign (1138-52), in which the civil wars of the Guelphs and Ghibellines (q.v.) began, was distracted by the dissensions of the great feudatories of the Empire, while the strength of Germany was wasted in the disastrous Second Crusade, in which Conrad took an active part. Frederick I. (1152-90), surnamed Barbarossa, Duke of Swabia, was, at the recommendation of his uncle, Conrad, chosen his successor, and the splendor of his reign fully warranted the selection. By the force of his character Frederick acquired an influence over the diets which had not been possessed by any of his immediate predecessors, and during his reign many important changes were effected in the mutual relations of the great duchies and principalities of Germany, while we now for the first time hear of the hereditary right possessed by certain princes to exercise the privilege of electing the Emperor. (See *ELECTORS*, *GERMAN IMPERIAL*.) Unfortunately for Germany, this great monarch suffered his desire to uphold the Imperial authority in Italy to draw him away from the interests of his own country, while his participation in the Crusades, in which both he and the flower of his chivalry perished, was memorable only for the

misfortunes which it entailed on the Empire. The interval between the death of Frederick Barbarossa (1190) and the accession of Rudolph I. (1273), the first Emperor of the Hapsburg line, was one of constant struggle, internal dissension, and foreign wars. Individually the princes of the Hohenstaufen Dynasty were popular monarchs, distinguished for their many noble and chivalrous qualities, while one of the race, Frederick II., was, after Charles the Great, perhaps the most remarkable sovereign of the Middle Ages; but their ambitious designs on Italy, and their constant but futile struggles with the Papal power, were a source of misery to Germany. The territory in which the Holy Roman Emperors of the time of Hohenstaufen exercised their sway, or their overlordship, reached on the west to the rivers Rhône, Saône, Meuse, and Scheldt (thus embracing a large strip of modern France, Belgium, and the Netherlands), and extended on the east to the borders of Hungary and Poland, including most of what is now Cisleithan Austria, exclusive of Galicia. On the north it extended as far as the Eider, and in the south nominal limits of the Empire reached down into Italy beyond Rome. Henry VI. (1190-97), son of Frederick Barbarossa, attempted to make the Imperial dignity hereditary in his family. After his death Philip of Swabia (1198-1208) and Otho IV. of Brunswick contended for the Imperial throne, the latter being recognized on the assassination of his rival by Otho of Wittelsbach. With Frederick II. (1215-50), the successor of Otho IV., ended the glory of the Empire, till it was partially revived by the House of Hapsburg. Frederick's son, Conrad IV. (1250-54), the last of the Hohenstaufen (q.v.), after a brief and troubled reign, was succeeded by various princes, who in turn, or in some cases contemporaneously (the Great Interregnum, so called), bore the Imperial title without exercising its legitimate functions or authority—William of Holland (1247-56), Alfonso the Wise of Castile (1257-62), Richard of Cornwall (1257-72). This season of anarchy was terminated at the accession of Rudolph I. (1273-91), of the House of Hapsburg, who, by the destruction of the strongholds of the nobles and the stringent enforcement of the laws, restored order. His chief efforts were, however, directed to the aggrandizement of his house. In 1276 he vanquished Ottokar II. of Bohemia, and forced him to give up the duchies of Austria, Styria, Carinthia, etc. Ottokar, having renewed the struggle, was defeated and slain on the Marchfeld in 1278. (See AUSTRIA-HUNGARY.) For the next two hundred years the history of the Holy Roman Empire presents very few features of interest, and may be briefly passed over. Adolphus of Nassau, who was elected to succeed Rudolph (1292), was attacked in 1298 by the son of the latter, Albert I. of Austria, who coveted the Imperial throne, and the war speedily ended in the triumph of Albert. The reign of this prince (1298-1308) is chiefly memorable as the period in which the three Swiss cantons of Unterwalden, Schwyz, and Uri succeeded in making themselves independent of the Austrian power. After the murder of Albert, the throne was occupied in rapid succession by Henry VII. (1308-13), of the House of Luxemburg (whose dynasty ruled for a century in Bohemia), and by the rival Emperors Frederick of Austria (1314-22) and Louis the

Bavarian (1314-47). Charles IV. (1347-78), the successor of Louis, of the House of Luxemburg, was the successful candidate among seven rivals. Although he was engrossed by the interests of his hereditary possessions of Bohemia, Moravia, Silesia, and Lusatia, he did not entirely neglect those of the Empire, for which he provided by a written constitution known as the Golden Bull (q.v.), issued in 1356, which regulated the rights, privileges, and duties of the Imperial electors, and the mode of election and coronation of the emperors. The seven princes designated in the Golden Bull as Imperial Electors were the archbishops of Mainz, Treves, and Cologne, the Duke of Saxony, the Margrave of Brandenburg, the Count Palatine of the Rhine, and the King of Bohemia. Charles's son Wenzel, or Wenceslas (1378-1400), who was finally deposed, brought the royal authority into contempt, from which it was scarcely redeemed by Rupert of the Palatinate (1400-10). The reign of Sigismund (1410-37), the brother of Wenceslas, is noteworthy in connection with the councils of Constance and Basel and the Hussite wars. With Sigismund the Luxemburg line of emperors terminated. In the person of Albert II. of Austria (1438-39), the House of Hapsburg once more secured possession of the Imperial throne, which, with slight interruption, was occupied by them to the end, although the crown remained elective. After a brief reign, in which he gave evidence of capacity for governing, Albert was succeeded by his cousin, Frederick III. (1440-93), an accomplished but avaricious and indolent prince, whose chief object seems to have been the aggrandizement of the House of Austria.

Aspirations toward national unity had appeared before this among the people of Germany, but they ran counter to the spirit of feudal anarchy, and to the family policy of the Hapsburgs, who became by their marriage alliances more and more involved in general European affairs and less interested in those of Germany. The emperors could not be made, therefore, the leaders of a national movement, which sought rather to realize itself, first through the Diet, and then in alliance with the Lutheran Reformation. (See REFORMATION.) Upon this conflict, and upon the religious differences which grew out of the work of Martin Luther and John Calvin, the politics of the Empire turned for 150 years. These tendencies developed fully under Maximilian I. (1493-1519), during whose reign an active agitation was carried on in the Diet for reform (see AULIC COUNCIL; IMPERIAL CHAMBER), while Luther's bold challenge in 1517 set into play giant forces of change which were destined to shape German history for all future. At the same time, the marriages of Maximilian drew the Hapsburgs more than ever into interests outside of Germany. The first of these marriages, with Mary, heiress of Charles the Bold of Burgundy (1477), added to the Hapsburg possessions the great Burgundian territories in the Low Countries; the second, with the daughter of Ludovico il Moro, Duke of Milan (1494), threw the Imperial house into the stormy politics of Italy. The marriage of the son of the Emperor, the Archduke Philip, with Joanna of Spain made that country, then at the summit of its prosperity and power, likewise a Hapsburg possession in the person of Maxi-

milian's grandson, Charles I. of Spain, who was elected Emperor in 1519 as Charles V. (1519-56). The energies of Charles were mainly directed to the prosecution of the war against France. The Austrian possessions of the House of Hapsburg were bestowed on his brother Ferdinand (from whom the present German-Magyar-Slav monarchy of Austria-Hungary may be said to date), the control of affairs in Germany was left largely in the hands of the Imperial chambers, the pressing need for reform received little attention, and the spread of the Reformation was allowed to continue unchecked. Luther, it is true, was placed under the ban of the Empire in 1521; but at Speier, in 1526, the Reformers gained a notable triumph, and it was not until the Diet of Augsburg, in 1530, that the Protestants and the Emperor came to an open breach. Danger from the French King and from the Turks, however, prevented Charles from taking action against the recusant princes, and for some ten years after 1531 the Schmalkaldic League (q.v.) of Protestant princes exercised a preponderating influence in German affairs. Only in 1546 did the Emperor find an opportunity for turning on the Protestants; the power of the Schmalkaldic League was broken in the battle of Mühlberg (1547), and the Protestant leaders, John Frederick, Elector of Saxony, and Philip, Landgrave of Hesse, were made prisoners. Charles was now supreme in Germany, and it seemed for a moment as if he would succeed in winning back the Protestants into the Catholic fold. (See under INTERIM, section on *Augsburg Interim*.) But jealousy of his growing power caused Maurice of Saxony, Albert, Duke of Mecklenburg, the Margrave of Brandenburg, and William, the son of Philip of Hesse, to league against him in alliance with the French King, Henry II., who in 1552 wrested from the Empire the bishoprics of Metz, Toul, and Verdun. The Treaty of Passau (q.v.), concluded in the same year, confirmed by the Peace of Augsburg in 1555, granted to the Lutheran States the right to establish the Protestant worship. Broken by the uniform ill success of his policy, Charles laid down the government of the Netherlands in 1555, and in the following year abdicated the Spanish and Imperial thrones, being succeeded in the Empire by his brother, Ferdinand I. (1556-64). The reigns of Ferdinand and Maximilian II. (1564-76) witnessed the very rapid growth of the Counter-Reformation (q.v.). Profiting by the dissensions prevailing among the Protestants, Roman Catholicism, issuing in renewed vigor from the Council of Trent (1545-63), boldly challenged the progress of the Reformed religion. Rudolph II. (1576-1612) was under the influence of the Jesuits, and lent himself to the aggressive policy of the Catholic party. In 1608 the Evangelical Union was organized under the leadership of the Elector Palatine, and this was followed by the foundation of the Catholic League in the following year. Matthias (1612-19) was less aggressive than his predecessor, but weak, and let himself be guided by the extreme faction of the Catholic party. The election of his cousin Ferdinand, a bitter enemy of the Protestants, to be King of Bohemia, in 1617, was the signal for the outbreak of a struggle that had long been seen to be inevitable. See THIRTY YEARS' WAR. The Thirty Years' War (1618-48), which was terminated in the reign of Ferdinand III. (1637-

57), left the rural districts of Germany almost depopulated, its trade and industries crippled, the people burdened with taxes, and the Imperial power weakened by the concessions made in the Peace of Westphalia to the autonomy of the individual States. Austria came to be regarded by the German nationalists as a foreign power, and the recognition of the Lutherans and Calvinists as factors in the Empire broke down the religious unity on which the mediæval Empire rested. Already, under Henry IV., France had adopted an anti-Hapsburg policy, rightly regarding that house, with its vast possessions, as the chief rival of France in European affairs. Richelieu (q.v.) carried on this policy vigorously during the Thirty Years' War, in assisting the Swedes and the Protestant princes against the Imperialists, and the French arms had a great share in forcing the Catholic powers to terms of peace. When the growth of the power of France in the seventeenth and eighteenth centuries threatened the balance of power in Europe, the Hapsburgs were naturally drawn into the coalition against France. (See LOUIS XIV.; SUCCESSION WARS, section on the *War of the Spanish Succession*.) The Imperialist forces under Prince Eugene of Savoy shared in the victories which put an end to the aggressions of Louis XIV., but the Empire derived no substantial advantage, except in the limitation that was put upon the growth of French predominance. The emperors during this period were Leopold I. (1658-1705), Joseph I. (1705-11), and Charles VI. (1711-40).

The rise of Prussia now becomes one of the most striking features in German affairs. Since the time of the Great Elector, Frederick William (1640-88), the Margraviate of Brandenburg had been acquiring increased importance as a leading power among the Protestant German States. In 1701 the Elector Frederick assumed the title of King of Prussia, and was so recognized. Thus, while still a vassal of the Emperor, he took rank by virtue of his royal title with the other independent sovereigns of Europe. Prussia, by reason of its rapidly increasing power, its Protestantism, and the energy infused into its administration, came to be the exponent of the German national spirit and of the enmity to Hapsburg domination. Frederick the Great (1740-86) was the mighty representative of this idea. The long effort of the Emperor Charles VI. to secure the guaranty of the European States for the Pragmatic Sanction (q.v.), which was intended to secure the unquestioned succession of his daughter Maria Theresa in the Hapsburg dominions, did not prevent an active contest which involved Europe in war (1740-48). (See under SUCCESSION WARS, the section on the *War of the Austrian Succession*.) Austria was stripped of the greater part of Silesia by Frederick the Great. After an interregnum, Charles Albert, Elector of Bavaria, was raised to the Imperial throne as Charles VII. in 1742. He died in 1745 in the midst of his unsuccessful war with Austria, and the husband of Maria Theresa, Francis Stephen, of the House of Lorraine, was elected his successor, assuming the title of Francis I. The peace which followed the War of the Austrian Succession was of brief duration. In 1756 Maria Theresa renewed the struggle with Prussia in order to recover Silesia. The historical hostility between England and France.

and between Austria and Prussia, developed into a general European war, in which, by a sudden change of alliances, Austria and France, with Russia, were ranged against England and Prussia. (See SEVEN YEARS' WAR.) Prussia came out of this bloody struggle with enhanced prestige, a recognized military power of the first rank in Europe. The well-meant but injudiciously applied reforms of the Emperor Joseph II. (1765-90) did not strengthen the incongruous Austrian State, and his attempts to restore the declining Imperial authority in Germany were frustrated by Prussia.

The French Revolution disturbed all previous adjustments. Austria, under the Emperor Leopold II. (1790-92) and his successor the Emperor Francis II., and Prussia, under Frederick William II. (1786-97), were for a time united in resistance to the revolutionary propaganda which threatened the thrones of Europe, but were defeated by the French armies. The advent of Napoleon played havoc with the Germanic system. He succeeded in partially isolating Austria and Prussia, by inducing many of the Western German princes to form the Confederation of the Rhine, and ally themselves with France (1806). Francis II. in 1806 laid down the title of Holy Roman Emperor, having previously assumed that of Emperor of Austria. This abandonment of a title that represented a system with which the whole history of Germany had been bound up was symbolic of the actual breaking up of the old order and the preparation for a new Germany. When Napoleon had been overthrown, it was found, in spite of the policy of conservative reaction, to be neither possible nor desirable to restore the old system. The more than three hundred semi-independent States which had existed in the eighteenth century had been consolidated by Napoleon into thirty-nine—a fact which was of much service in promoting German unity. Prussia, which had been dismembered by Napoleon and trodden under foot, emerged from the War of Liberation rejuvenated by the patriotism of its people and strengthened by thorough-going reforms, and was prepared again to dispute precedence with Austria in the Germanic body. It was manifestly impossible to restore the old Imperial arrangements, which had become worthless long before they were cast aside. The Congress of Vienna (see VIENNA, CONGRESS OF), therefore, in 1815 instituted a Germanic Confederation under the guaranty of the European powers. There was to be a Federal Diet, in which Austria was to have the presidency.

All of the German States were now disturbed by agitations for constitutional government, which were fought inch by inch by many of the princes. The dominant spirit among the rulers was that of reaction, and the control of affairs was largely in the hands of the astute Austrian Chancellor, Prince Metternich (q.v.). Three parties represented the contending ideas of government held in Germany after the Restoration—the absolutists, among whom were found most of the reigning families, including those of Austria and Prussia; the party of historic rights, who had no faith in constitutions, but stood on the traditional customs of the German people, such as the assemblies of estates; and the constitutionalists, liberal and more or less democratic, strongest in South Germany, where the French influ-

ence had been most felt. This liberalism was especially fostered among the students in the universities (see BURSCHIENSCHAFT), and was closely connected with the spirit of nationalism, which was rapidly gaining strength. The chief obstacle to national unity was now, as it had always been, the obstinacy with which the princes clung to their feudal status and to the independence which had grown therefrom. The problem had been made simpler by the Napoleonic consolidations, but the princes who remained were made stronger by the same means. Only the leadership of some State that should be willing to represent the aspirations of the people, and strong enough to coerce resisting States, could accomplish what the nationalists sought. This rôle was reserved for Prussia. The revolutionary agitation of 1830 was felt in Germany, and gave some impulse to the constitutional movement, strengthened by the establishment of the Zollverein (q.v.) or Customs Union, due to the initiative of Prussia; but it was not until the more stirring year of 1848 that the forces of discontent and progress that had been at work in spite of Metternich's repressive policy really showed themselves in their strength. On March 13th Metternich was driven from power. (See AUSTRIA-HUNGARY.) A few days later a successful popular rising took place in Berlin, and at the same time Louis I. of Bavaria was compelled to abdicate. In April there was a republican insurrection in Baden, which, however, was speedily suppressed. In response to the demand for a National Parliament, such a body was assembled at Frankfort (May 18, 1848-May 13, 1849). A provisional national government was organized under an Imperial administrator, the Archduke John of Austria. The Parliament, however, was divided into factions, and a struggle between the Austrian and Prussian parties ensued. Austria sought to bring its whole Empire into the new organization, with a preponderating voice in affairs, which would have made the new Empire non-German. Prussia and the German nationalists objected, and finally carried the day, choosing the King of Prussia to be Emperor of the Germans (1849). Frederick William IV. was not equal to the great opportunity, and he rejected the proffered crown because it came from the people and not from his peers, the German princes. The desertion of the national cause by Prussia was followed by insurrections in the Palatinate, Saxony, and Baden, which were rigorously put down, mainly by the arms of Prussia, and the opportunity for the erection of a German nation went by until it should be recreated by the 'blood and iron' policy of Bismarck (q.v.). The National Parliament having gone to pieces, Austria and Prussia united in 1850 to restore the old Diet. The two powers now proceeded to establish the old order in the duchies of Schleswig and Holstein, which had risen in revolt against Denmark. Prussia assumed the leadership in proposing plans for reorganizing the Germanic body, but could not harmonize its own ambitions with those of Austria. In 1858 Prince William became Regent of Prussia, and in 1861 succeeded his brother as William I. Imbued with the conservative spirit of the Hohenzollerns, but possessed of much sound sense, courage, and patriotism, he met the existing situation in a different spirit from that of his weak predecessor. Bismarck early became

his chief minister, and remained at his side until his death. The latter saw the futility of all efforts at German organization that had been previously made, and determined that the only way to the attainment of the great object was for Prussia to force a direct issue with Austria, and fight it out as the champion of German nationality. The opportunity was found in the troubled affairs of Schleswig-Holstein (q.v.). By the Convention of Gastein (August 14, 1865), Austria and Prussia arranged a joint occupation of the duchies, against the wishes of the smaller States represented in the Diet. In this common administration, although the sphere of each power was defined, there was ample opportunity for the outbreak of the old rivalry. Austria sought to force the hand of Prussia by referring the settlement of the Schleswig-Holstein question to the Federal Diet. Prussia met this move by sending its forces into Holstein, which had been under Austrian occupation. The Diet now ordered the mobilization of the Federal forces (June 14, 1866). Prussia at once began hostilities, having previously formed an alliance with Italy against Austria. (See SEVEN WEEKS' WAR.) Prussia's preparedness was shown by her prompt action in each detail. She ordered Hanover, Hesse-Cassel, and Saxony, which had adhered to Austria, to disarm, and at once invaded their territories. The Saxon army retired through Bohemia, to effect a junction with the Austrians; the Hanoverians laid down their arms after a useless show of resistance; and the Prussians, having secured their base, declared war against Austria, and invaded Bohemia in three columns. The rapid movement, efficiency, and thorough equipment of the Prussian Army surprised Europe as much as did the inefficiency and lack of organization of the Austrians. In the vigorous campaign, whose brief duration has given its popular name to the war, Austria met a succession of defeats, culminating in the overwhelming one of Sadowa, or Königgrätz, July 3d. By the Peace of Prague (August 23, 1866) the dissolution of the old Confederation was consummated. Austria ceased to be a member of the Germanic body, and Schleswig-Holstein, Hanover, Electoral Hesse, Nassau, and Frankfort were incorporated with Prussia, which negotiated separate treaties with Baden, Bavaria, the Grand Duchy of Hesse, Saxony, and Württemberg.

The North German Confederation was now constituted under Prussian leadership. Bavaria, Württemberg, and Baden allied themselves with the new body, though they did not enter it. Their treaties with Prussia provided for an offensive and defensive alliance, and acceptance of Prussian leadership in case of war. The Constituent Diet of the new Confederation met February 24, 1867, and proceeded to frame a constitution, which forms the basis of that of the present Empire. The aspirations of Prussia looked to the completion of German unity and the establishment of the paramount influence of the new German State in European affairs. Bismarck was well aware that the consolidation of Germany meant eventual war with Germany's ancient enemy, and he prepared for it as thoroughly as he had for the conflict with Austria. War was narrowly averted in 1867, when France sought to occupy Luxemburg as a compensation for the territorial acquisitions of Prussia, and in 1869, when France showed unequivocally her desire to annex

Belgium. The intention of Spain to seat a Hohenzollern prince on the vacant throne offered an opportunity for her quarrel which France was now seeking, and the injudicious conduct of Benedetti, the French Minister at Berlin, the fatuous insistence of the French Foreign Minister, Gramont, upon an impossible apology from King William, and the shrewd and unscrupulous use made by Bismarck of the dispatch relating thereto, stirred a feeling in both countries that could only result in war, which was declared by France July 19, 1870. The French, not realizing that the day of Napoleonic conquests had passed, still less that the day of United Germany had come, expected to invade Germany, win over the Southern German States, and to march straight on Berlin. Instead, they found the German Army mobilized on the frontier, and the South German States loyal to their alliance. A quick succession of German victories was followed by the surrender of MacMahon's army and the capture of Napoleon himself at Sedan (September 2, 1870), the investment of Paris, and the capitulation of Bazaine at Metz (October 27th). While the united armies of Germany were still besieging Paris, King William, at Versailles, in the *Galerie des Glaces*, amid a brilliant assemblage of princes and officers, received from the people of Germany, in pursuance of the decree of the North German Diet of December 10, 1870, the title of German Emperor, hereditary in the Prussian Dynasty (January 18, 1871). On the 16th of April the Constitution of the Empire, which was substantially that of the North German Confederation, with the addition of certain special provisions for the South German States, was promulgated. By the treaty of peace with France, signed on the 10th day of May, at Frankfort-on-the-Main, Germany received the provinces of Alsace, with the exception of Belfort, and the German-speaking part of Lorraine, including Metz and Thionville, and an indemnity of five milliards of francs (\$1,000,000,000). See FRANCO-GERMAN WAR.

The southern States had entered the new Empire, and the King of Bavaria, the largest German State outside of Prussia, had acted as spokesman in proffering the crown of United Germany to King William. The military preponderance of France on the Continent of Europe was at an end. Secure in its position as a dominant power, the new Germany was free to develop its national genius. But Bismarck's internal policy during the first years of the Empire was not as successful as his State-building process had been. He became involved in a conflict with the Roman Church, and this became the leading issue in Imperial politics for six years, from 1873 to 1879. (See KULTURKAMPF.) The preponderating position of Germany in the affairs of Europe was asserted at the time of the Russo-Turkish War (1877-78), when the Congress of Berlin was convened for the settlement of the Eastern Question. After the attempts upon the life of the Emperor in 1878, attributed to Socialist fanatics, vigorous legislative measures were taken to suppress Socialism as an organized force, while at the same time the Government undertook legislation for the benefit of the working classes, such as compulsory State insurance. An extensive system of canals was begun in 1886, including the great Kaiser Wilhelm Canal, connecting the North Sea and the Baltic, which was opened June 19,

1895, with imposing ceremonies. As soon as Austria had been expelled from the Germanic body it became Bismarck's policy to cultivate friendly relations with that country, as Germany's closest neighbor and kin, and in 1883 the Triple Alliance (q.v.), comprising Austria, Germany, and Italy, was formed, with the object of maintaining the balance against France and Russia. In 1884 Germany embarked upon her career as a colonizing power. (See GERMAN EAST AFRICA; GERMAN SOUTHWEST AFRICA; KAMERUN.) Emperor William I. died in 1888, and was succeeded by his son, Frederick III., who was then suffering from cancer of the throat, and died in a few months. He was succeeded by his son, William II. The history of Germany since his accession has been characterized by the social and economic movements common to all of the Western nations at the close of the nineteenth and at the opening of the twentieth century, while as a growing world power Germany has become one of the chief factors in the questions arising from the colonial enterprises of the nations of the West and the increasing solidarity of mankind. Differences very early developed between the Kaiser and the great Chancellor, and an issue having been made on the Government's policy toward the Socialists, Bismarck was ordered to resign, and his resignation was accepted March 20, 1890. He was succeeded by General von Caprivi (q.v.). The Emperor himself, after his plan of an international labor conference had failed, became a bitter opponent of the Socialists. After 1879 Germany maintained a protective tariff, and duties were considerably increased in several directions, though the operation of the fixed tariff was much modified by tariffs based upon reciprocity treaties. The steady development of German industry and commerce checked the stream of emigration, and the population has continued to increase at an undiminished rate. Caprivi retired from the Chancellorship in 1894, giving place to Prince Hohenlohe. Of recent years very active interest has been taken in the development of the merchant marine and navy. The Naval Bill of 1898 pointed in its preamble to the increased volume of imports and exports, colonial expansion, increasing population, and the investment of large amounts of capital abroad as indications of the need of a strong navy. The bill (passed March 28, 1898) provided for an expenditure of an amount equivalent to \$102,000,000, of which \$89,000,000 was to be expended on fleets and armament. This was expected to bring the strength of the navy up to 19 battle-ships, 8 coast-defense vessels, 9 large and 26 small cruisers, and numerous smaller craft. A bill passed with some difficulty in June, 1900, practically doubled this programme, extending the period of operation over twenty years, and providing for 33 battle-ships and a corresponding complement of cruisers and smaller vessels. As in all the constitutional countries of Continental Europe, strong party organization is made impossible in Germany by the numerous factions and the lack of a responsible Ministry. (See POLITICAL PARTIES, paragraph on Germany.) Prince Bismarck had been reluctantly forced into a colonial policy by the growth of German commercial interests, and William II. actively promoted this development in various parts of the world. In 1898 he seized the pretext of the murder of two German mis-

sionaries in China to exact from that country the cession of the port of Kiao-chau and 200 square miles of adjacent territory, and to establish a sphere of influence in Shan-tung, one of the richest Chinese provinces. He then attempted, during the outbreak of 1900 and in the events which followed the Boxer movement, to claim for Germany in the Far East the same predominant rôle that Bismarck had sought to win for her in Europe. (See CHINESE EMPIRE.) Prince Hohenlohe resigned the Chancellorship in 1900, partly because of disagreement with the Emperor's Chinese policy, and was succeeded by Count von Bülow. German commercial and industrial activities are now world-wide. The actual territorial possessions of the Empire outside of its own borders are in Africa, in the partition of which Germany has had a large share (see AFRICA), and a few islands in the Pacific; but German settlements, merchants, and factories are found in Mexico, Central and South America, and in Asiatic Turkey, and German banks in many parts of the world are the stable foundation of activity in trade and industry. German colonization and commercial societies, well supported financially and managed with skill and energy, support these enterprises, and are actively fostered by the home Government. Such associations are found operating in Central and South America, in Senegambia, on the Gold Coast, in Australia, Tahiti, and Sumatra, as well as in the countries under the German flag. Parallel with this activity in the world's industrial competition has been a very intelligent policy of subsidizing steamship lines to Oriental and African ports, intended to make Germany independent in its carrying trade. In every way the German Government supports its citizens in spreading German influence, and it has never failed to defend the interest of German merchants where these have been threatened by disorder or revolution in weakly governed countries, as in Haiti at the end of 1902, or in Venezuela (q.v.), in conjunction with Great Britain and Italy, in the early part of 1903.

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GERMAN Y LLORENTE, HÀR-mán' é lyó-rán'tá, BERNARDO (1685-1757). A Spanish painter, born at Seville. He studied under his father and Cristobal Lopez. He painted the portrait of the Infant, Don Philip, with such success that in 1717 he was called to Madrid by Philip V., who desired to make him Court painter, but he declined the honor, preferring an independent life. In 1735 he was made a member of the

Academy of Saint Ferdinand. The works of this artist resemble closely those of Murillo in their grace, correctness of drawing, and groupings, and in other countries they have been sold as original Murillos. He so frequently painted the Virgin as a shepherdess that he was called the 'Painter of Shepherdesses.' One of these paintings is in the Church of San Ildefonso, Madrid, and another in the Prado.

GERM-CELL. See CELL and EMBRYOLOGY.

GERMERSHEIM, gér'mèrs-hím. A fortified town in the Bavarian Palatinate, Germany, situated a short distance from the Rhine, and nine miles southwest of Speyer. It has some manufactures. Population, in 1900, 5868. The Romans had a station here under the name of Vicus Julii. The French were defeated here by the Austrians in 1793.

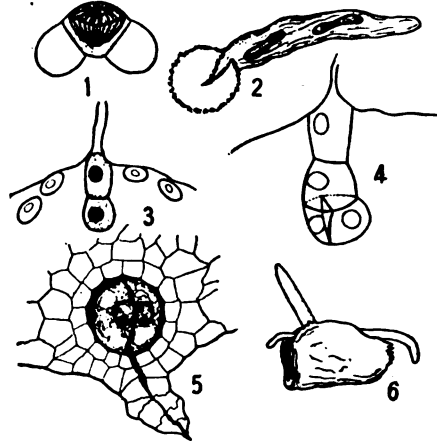
GERMINAL, zhâr'mé'nâl' (Fr., relating to buds). (1) The name for the seventh month of the year in the French Republican calendar, from March 21st to April 19th during the years I.-III., and from March 22d to April 20th during the years VIII.-XIII. (2) One of the Rougon-Macquart novels by Zola (1885), dealing pessimistically with the question of labor as shown in the mines. Etienne, a type of laborer who has fallen under the influence of socialistic ideas, is contrasted with the rich Grégoire, indifferent to the problems of the workmen. The story introduces strongly drawn characters, and its descriptions of the collier's life and of the scenes of the strike are among Zola's best work.

GERMINAL INSURRECTION. A name given to the bread riots against the Convention at Paris, which occurred on April 1, 1795 (12th Germinal, Year III.).

GERMINATION (Lat. *germinatio*, from *germinare*, to bud, from *germen*, bud). The process by which a spore begins the development of a plant body. Technically, only spores germinate, but this term has been extended to include the process by which the embryo escapes from the seed. The so-called germination of the seed, however, is not true germination, since it is the escape of an embryo which has already been germinated, and true germination includes the very beginnings of the young plant. In the case of a seed, germination begun by a fertilized egg has been checked, and seed-germination is the resumption of activity and the escape of the young plant.

The conditions of germination are uniform. In general, they are suitable amounts of water, of heat, and of oxygen. Naturally the range in each one of these factors is very great, some spores germinating in the presence of a comparatively small amount of water, or at a relatively low temperature, while others need a large amount of water or high temperature. Between these extremes there is every possible combination of requirements. Some spores germinate almost immediately after they have been transported from the parent plant; while others may pass into a resting condition of greater or less duration. This difference in habit is generally apparent in the different character of the spore wall, those spores which are to germinate quickly having thin walls, and those which are to pass into a resting condition having thick walls. Since the spore consists of a single cell, the first

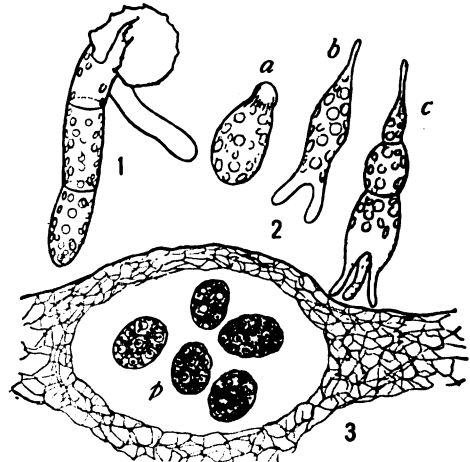
evidence of germination is the activity of the cell, which usually enlarges, and then divides, resulting in a two-celled embryo. One or both of the daughter cells then grow to mature size, and division then occurs. In this process of growth and division, the spore wall is broken, and the young plant emerges, and continues its development by drawing upon the reserve food-supply in the spore until it is able to maintain itself.



GERMINATION.

1 and 2, germination of pollen-grain of pine; 3 and 4, young embryo of buttercup; 5 and 6, first and last stages of embryo of a fern.

The early stages of germination have attracted a great deal of attention, under the impression that they furnish proofs of the relationships of groups. Accordingly, the order of succession and the direction of cell-walls have been carefully noted. In case the plant is a complex one,



GERMINATION.

1, Young prothallium of a fern; 2, three stages in the germination of a green alga, beginning with the spore (a); 3, young plants of a liverwort developing from spores within the sporangium.

after a certain number of cells have been developed, the different regions of the body begin to appear. For example, in an embryonic seed-plant it would be impossible for a time to tell what kind of plant is to develop, but after a

homogeneous cell-mass of greater or less extent is formed, the organs begin to appear which determine the character of the plant.

In the case of alternation of generations (q.v.) the germination of the sexual spore (fertilized egg) results in a sexless plant (sporophyte); while the germination of the asexual spore results in a sexual plant (gametophyte). Among the heterosporous plants (those producing two kinds of asexual spores), that is, in certain fern-plants and all the flowering plants, the sexual plants (gametophytes) do not escape from the spores which germinate them. For example, the pollen-grain is a spore which by its germination produces a male gametophyte, but this gametophyte is so much reduced that it is represented only by a few cells or nuclei within the pollen-grain. The same is true of the germination of the megaspore in seed-plants, which is retained within the ovule, and which in its germination develops the so-called endosperm, which is the female gametophyte. With the exception of heterosporous plants, however, the germinating plantlet soon escapes from the spore.

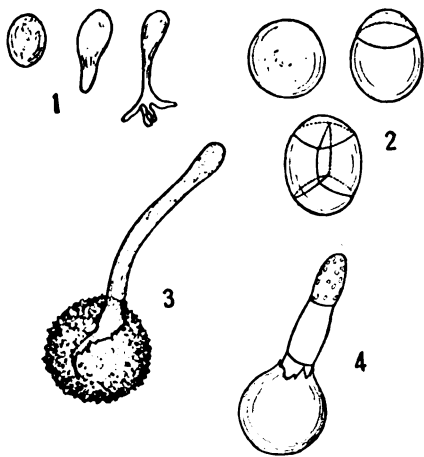
In the so-called germination of the seed there are numerous events which may be observed. Attention has been called already to the fact that this process is not technically germination, but merely the renewal of activity, and the escape of the young plantlet. Just how long different seeds may retain their vitality in a state of suspended animation is not definitely known. Some seeds have renewed activity after having remained in a dried-up condition for many years, but such stories as that the wheat taken from the wrappings of Egyptian mummies has been

to germinating, as in the process of malting, the heat may become very evident. The first part to protrude from the seed is the hypocotyl (q.v.), the tip of which is thrust out by the rapid elongation of its upper part. This protruding and rapidly elongated tip, which is to develop the root, now rapidly increases in length, and is very sensitive to the influence of gravity and of moisture, responding by developing any curvature necessary to reach the soil. Penetrating the soil and beginning to put out lateral branches, it secures the grip necessary for the extrication of the other regions of the embryo. After some anchorage has thus been obtained, the upper part of the hypocotyl again begins a period of rapid elongation, which results in the development of a curvature known as the hypocotyl arch. In the case of the germinating bean this arch is the first structure to appear above ground, and its pull upon the seed is very apt to bring it to the surface. Finally, the arch in its effort to straighten pulls the cotyledons out of the seed-coats, and with them the stem-tip, the axis of the plant straightens up, the seed-leaves and sometimes other leaves expand, and germination is over; for, with roots in the soil, and green leaves expanded to the air and sunlight, the plantlet has become independent. These details are not the same for all seeds, for there are certain notable variations. For example, in the pea and acorn the cotyledons are so gorged with food as to have lost all power of acting as leaves, and are never extricated from the seed-coats. In the cereals, as corn, wheat, etc., the embryo lies close against one side of the seed, so that it is completely exposed by the splitting of the thin skin which covers it. In such a case the cotyledon is never unfolded, but remains as an absorbing organ, while the root extends in one direction and the stem with its succession of ensheathing leaves develops in the other.

GERMINIE LACERTEUX, zhâr'mé'né' lá'sâr'té'. A realistic romance by Edmond and Jules de Goncourt (1865), in which the authors aim to present, as they say, a 'clinic of love.' The story is that of a poor country girl who comes to Paris, and through the fault of another is launched upon a career to the dangers of which her temperament renders her peculiarly liable, and which finally brings her to death on a hospital cot. The study is based on actual observation by the authors. It was dramatized by Edmond de Goncourt, and produced at the Odéon in 1889.

GERM-PLASM. The kind of protoplasm supposed by some embryologists peculiar to the germinal part of the ovum and regarded as containing such chemical or molecular composition and properties as to determine the special character of the resulting organism. This singularity is supposed to be inherited and so continue from generation to generation.

GERNSHEIM, gërns'hîm, FRIEDRICH (1839—). A German composer. He was born at Worms, and studied at Mainz (under Pauer), Frankfurt-on-the-Main, at the Leipzig Conservatory, and in Paris. After conducting at Saarbrücken (1861-65) he was called to the Conservatory of Cologne, where he also conducted several musical societies, and in 1873 was appointed to the leadership of the opera orchestra. He was afterwards long associated, as the successor of Bargiel, with the Conservatory at Rotterdam, where he



GERMINATION.

1, Development of Botrydium (alga) from the egg; 2, egg-mentation of egg of a brown alga; 3, a young fungus coming from the egg; 4, young prothallium of Equisetum.

made to germinate are myths. Seed-germination results in freeing the embryo from the seed-coats, and in enabling it to establish itself for independent living. The first conspicuous change noted in the seed after the absorption of water is the softening of the contents, the solid or insoluble starch, if that be the form of the food storage, being converted by a process of digestion into soluble sugar ready for transfer. Accompanying this change there is a marked evolution of heat, so that if a large mass of seeds is set

also conducted the famous 'Winter Concerts,' and after 1890 was conductor of the Stern Choral Society in Berlin, one of the most prominent singing societies of Germany. His compositions include symphonies, overtures, choral works, and a great variety of chamber music.

GERO, gá'ró. A German hero in the *Nibelungenlied*. He is an historic character who, as Margrave of the Ostmark, in 939, conquered all the Slavic tribes between the Elbe and the Oder, and died in 965.

GEROK, gá'rók, KARL (1815-90). A German preacher and religious poet. He was born at Vaihingen, Württemberg, January 30, 1815, studied at Tübingen, became chief Court preacher in Stuttgart, 1868, and died there January 14, 1890. His sermons, and particularly his religious poetry, were much admired. The chief collection of the latter was entitled *Palmbblätter* (1857), English translation by Brown (London, 1869).

GÉRÔME, zhá'róm', JEAN-LÉON (1824-1904). A French painter and sculptor, one of the most eminent artists of the nineteenth and early twentieth centuries. He was born May 11, 1824, at Vesoul, Haute-Saône, France. His father, a goldsmith, encouraged the artistic tendencies of his son. Léon's copy of a picture by Decamps was seen by a friend of Delaroche, which led to Gérôme's entering the atelier of that master in Paris, at the age of fifteen. Three years later he went with Delaroche to Rome. With the exception of a few months with Gleyre, all Gérôme's early training was received from Delaroche. He assisted Delaroche on his picture of "The Passage of the Alps by Charlemagne," now in the Versailles Museum. In 1847 Gérôme was unsuccessful in the competition for the Prix de Rome, but the picture, a "Greek Cockfight," now in the Luxembourg, which he exhibited at the Salon of that year, was the sensation of the day. This picture was followed by the "Anacreon, Bacchus, and Cupid" (1848), now in the Museum of Toulouse. In 1848 he won the second-class medal at the Salon. In 1850 he exhibited the "Greek Interior," and in 1855 the "Age of Augustus," an immense picture now in the Museum of Amiens.

All the most splendid qualities of the art of Gérôme appear in the great picture of "Morituri te Salutant" (the "Gladiators Before Cæsar"), which was exhibited in 1859. In 1854 Gérôme visited the Danube provinces, and in 1857 Egypt, stopping at Constantinople on the way. He was made professor of painting at the Ecole des Beaux-Arts in 1865, and won a medal of honor at the University Exposition of 1867. He was made chevalier of the Legion of Honor in 1855, officer in 1867, and afterwards commander.

Gérôme painted an enormous number of pictures, which are largely held in the museums of France. A partial list only can be given. He exhibited the "Phryne Before the Tribunal" in 1861; "The Two Augurs" and the portrait of Rachel in 1861; the "Cleopatra and Cæsar" in 1866; the "Slave Market" and the "Death of Cæsar" in 1867; and the "Promenade in the Harem" in 1869. He painted the "Plague at Marseilles" as a decoration in one of the chapels of the Church of Saint-Séverin in Paris.

Gérôme exhibited his great picture "Pollice Verso," companion to the "Gladiators Before Cæsar," in 1873. These two pictures were considered by the painter himself his best works.

Of his later pictures the most important are: "Eminence Grise" (1876); "Rex Tibicen," "Frederick the Great Before the Bust of Voltaire" (1876); "Saint Jerome" (1878); "Slave Market in Rome" (1884); "Great Bath at Brusa" (1885).

At the Universal Exposition in Paris in 1878, Gérôme made his début as a sculptor of the first rank. He reproduced in bronze, and larger than life, the central group of the "Pollice Verso," a gladiator standing over his conquered antagonist, and awaiting the signal of the Vestal Virgins, the thumb turned down, which was, according to a supposition now superseded, the death-sign in the arena. The best of Gérôme's later work is in sculpture. The most characteristic is a series of bronze equestrian statuettes, among which are "The Entry of Bonaparte into Cairo," "Frederick the Great," and "Tamerlane." Consult: Claretie, *Peintres et sculpteurs contemporains* (Paris, 1884); Cook, *Art and Artists of Our Time*, vol. i. (New York, 1888); Low, "Gérôme," in Van Dyke, *Modern French Masters* (ib., 1896).

GERONA, há-ró'ná. The capital of the province of the same name, Spain, 52 miles northeast of Barcelona, situated on both sides of the river Oñar, near its confluence with the Ter (Map: Spain, G 2). Built at the foot and on the slope of two hills, the fortified Monjuich commanding the city, it comprises two parts, the city proper with the narrow, dingy streets of a mediæval town, which nevertheless has the finest architectural features, and the suburb, El Mercadel, presenting a modern appearance. The rivers Güell and Galligans empty into the Oñar, the former just north of the city, while the latter flows through it, and many of the houses are built directly on the river's brink—a circumstance that has caused the floods, particularly those of 1762 and 1829, to be extremely disastrous. Gerona still retains part of its old walls, and has plazas and promenades; but its chief attractions are in its churches. The noble Gothic cathedral stands on the site of an earlier church dedicated in 1038, the modern edifice having been begun in 1416; the nave, 73 feet in width, is one of the widest Gothic vaults in the world. Also noteworthy are the churches of San Felix and San Pedro. There are a large poor-house, a hospital in connection with which is an insane asylum, and two public libraries, the provincial library having over 13,000 volumes. The citadel serves as a State prison. The manufactures of the city, which comprise paper, textiles, cork, etc., are increasing in importance; and in the vicinity coal, iron, copper, and lead are mined. There are also mineral springs. Population, in 1900, 15,668.

Gerona, the ancient Gerunda, is one of the oldest cities of Spain, its origin being ascribed to the tenth century B.C., though it appears first in history during the Punic Wars. In the Middle Ages it was known also as Gironda. The town submitted to the Moors in 717 and in 797 came finally into the possession of the Frankish borderers, who for a time ruled it in the name of their kings. Subsequently it passed into the possession of the counts of Barcelona. It was erected into a dukedom about the middle of the fourteenth century, and in 1414 into a principality for the eldest son of the King of Aragon. Gerona played a part in the War of the Spanish

Succession, suffering severely with the rest of Catalonia. It became celebrated for the stubborn fighting qualities of its inhabitants. Its crowning exploit was achieved in 1809 in the Spanish War of Liberation, when it held out from June 8th to December 10th against the French, who had invested it in the preceding year, yielding only when its citizens succumbed to famine and disease. The French loss during the siege was estimated at 15,000.

GERONIMO. A chief of the Chiricahua tribe of Apache Indians in North America. During 1884-85 Geronimo had surrounded himself by a band of hostile Indians, who terrorized a great part of New Mexico and Arizona. Against them, early in 1886, General Sheridan sent Gen. George Crook, who had already won considerable renown as an Indian fighter. In March a truce was made, followed by a conference between Crook and Geronimo, at which terms of surrender were agreed upon. Before they could be carried out, however, the Indians escaped to the mountains, and General Crook was superseded in command by Gen. Nelson A. Miles. General Miles immediately began an active campaign against the Indians. He followed them into the mountains, and gave them no rest, until at length Geronimo was glad to make peace, and to accept the terms offered by General Miles, which provided for the deportation of Geronimo and his leading followers to Fort Pickens, Fla., and their personal detention there.

GÉRONTE, zhà'rônt'. In French classical comedy, a type of the old man, originally simply a father, without comic features. The character appears especially in Corneille's *Le menteur*, in Molière's *Le médecin malgré lui* and *Les fourberies de Scapin*, and in Regnard's *Le joueur*, *Le retour imprévu*, and *Le légataire universel*. In the *Menteur* the character has dignity and restrained emotion. In the *Médecin malgré lui* and the *Fourberies* he has become purely a grotesque dupe, miserly, obstinate, and credulous, and an easy prey for his rascally valet.

GERRARD, jê-rârd'. (1) The name of the 'King of Beggars' in Beaumont and Fletcher's *Beggar's Bush*, which he temporarily exchanges for the alias of Clause. (2) The youthful intriguer in Wycherley's *Gentleman Dancing-Master*, who conducts a flirtation by assuming the disguise of a dancing-master.

GERRESHEIM, gër'es-hîm. A town in the Rhine Province, Prussia, 4 miles west of Düsseldorf. It is an industrial centre of growing importance, with extensive glass-factories and other manufacturing establishments. Its Romanesque parish church dates from the thirteenth century. Population, in 1900, 11,541.

GERRY, gër'ri. ELBRIDGE (1744-1814). An American statesman. He was born at Marblehead, Mass., July 17, 1744, the son of a merchant. He graduated in 1762 at Harvard, where three years later he took a master's degree, and, abandoning his original intention of entering the medical profession, became a successful merchant in his native town. In May, 1772, he entered upon his long political career as a member of the General Court of Massachusetts, and here immediately identified himself with the Patriot Party, particularly as represented by Samuel Adams, with whom from this time forward he

was closely associated in opposition to the arbitrary measures of the British Ministry. He was reelected in 1773; was soon afterwards appointed by the Legislature, with Hancock and Orne, a member of the Committee of Correspondence; and in 1774 and 1775 was a prominent member of the Massachusetts Provincial Congress, by which, after the battle of Lexington, he was charged with procuring a supply of gunpowder for the Province, and before which late in 1775 he introduced a bill, passed on November 10th, for arming and equipping ships for aggressive service against the British mercantile and military marine. This bill, says Gerry's biographer, Austin, was "the first actual avowal of offensive hostility against the mother country which is to be found in the annals of the Revolution," and the "first effort," as well, "to establish an American naval armament." Samuel Adams spoke of it as "one of the boldest, most dangerous, and most important measures . . . in the history of the New World, the commencement of a new maritime and military power." In 1776 Gerry was elected to the Continental Congress, in which he served for the next four years, during which time he took an active part in securing the passage of many measures of importance, was a member of various important committees, and in particular was conspicuous as a vigorous advocate of the Declaration of Independence, which he signed. He was also prominent as a member of three committees appointed (in September, 1776, July, 1777, and November, 1777) to visit Washington's camp on behalf of Congress, and more especially as a member of a standing committee for superintending the treasury, of which he was for some time chairman, and which exercised a virtual control over the finances of the country throughout the Revolutionary War. He was accused, but apparently with little justice, of supporting, or at least countenancing, the Conway Cabal (q.v.) in its efforts to displace Washington; and in 1779, as head of the treasury board, came into conflict with Gen. Benedict Arnold, some of whose accounts he had refused to audit. In February, 1780, he withdrew from Congress owing to its refusal to record the yeas and nays on a question of order raised by him, and the Massachusetts General Court, to which he appealed, sustained him in his position. On his return to Massachusetts he was elected a member of both the Upper and the Lower House in the first Legislature under the new State Constitution, and accepted a seat in the latter.

In 1783 he resumed his seat in the Continental Congress, which he retained for three years, during which time he was a member of the committee appointed, in 1783, to consider the definitive treaty of peace, was chairman of each of two committees appointed to choose a suitable location for a national capital, and again took a prominent part in the initiation and discussion of financial measures. He was also conspicuous in 1784 as an opponent of the Society of the Cincinnati. He again became a member of the Lower House of the State Legislature in 1785; declined an appointment to the Annapolis Convention (q.v.) in 1786; and in 1787 was sent as one of the Massachusetts delegates to the Constitutional Convention at Philadelphia, where he was prominent as an opponent of the Constitution as finally

adopted, refusing, along with Randolph and Mason, to affix his signature. His chief objections, as stated by himself, were, "that there is no adequate provision for a representation of the people; that they have no security for the right of election; that some of the powers of the Legislature are ambiguous and others indefinite and dangerous; that the Executive is blended with and will have an undue influence over the Legislature; that the judicial department will be oppressive; that treaties of the highest importance may be formed by the President, with the advice of two-thirds of a quorum of the Senate; and that the system is without the security of a bill of rights." After the organization of the Government he was elected one of the representatives of Massachusetts in the first and second Congresses under the Constitution. Subsequently he remained in retirement at Cambridge until 1797, when, war with France appearing imminent, he was sent, along with Marshall and Pinckney, on an important mission to the French Directory. The envoys, unable to secure official recognition, were forced to submit to various indignities and humiliating rebuffs, while disgraceful propositions were made to them by Talleyrand and his secret agents; and Marshall and Pinckney soon left in disgust. Gerry, however, being the only Republican on the commission, and therefore being, presumably, more favorably disposed than his colleagues toward the French Government, remained for some time longer, at the request of Talleyrand, but accomplished nothing. (See X Y Z CORRESPONDENCE.) For thus remaining he was acrimoniously attacked by the Federalists upon his return to the United States. He was several times defeated for Governor of Massachusetts, but was successful in 1810, and in 1811 was reelected. His administration was fiercely criticised by the Federalists on the ground of its alleged partisanship, and color was given to the charge by the enactment by the Republican Legislature of a law, which Gerry signed, but of which he seems to have disapproved, for redistricting the State in such a manner as to annihilate the Federalist majorities in several counties. (See GERRYMANDER.) From 1813 until his death he was Vice-President of the United States. He died suddenly on November 23, 1814, and in 1823 a monument was erected to his memory by order of Congress. He married the daughter of Mr. James Thompson of New York City, and left a family of three sons and six daughters. Consult Austin, *Life of Elbridge Gerry, with Contemporary Letters* (Boston, 1828-29).

GERRY, ELBRIDGE THOMAS (1837—). An American lawyer and philanthropist, born in New York City, a grandson of Elbridge Gerry (q.v.). He graduated at Columbia College in 1857. During his practice as a lawyer he accumulated one of the finest libraries of works on jurisprudence in America. He became prominently connected with numerous reformatory and benevolent organizations, and in 1874 founded the Society for the Prevention of Cruelty to Children. In 1886 he was chairman of the commission which advocated the abolition of the gallows and the substitution of electricity for capital punishment in New York.

GERRYMANDER, gér'ri-mán'dér. A word belonging to the political vocabulary of the United States, and used to denote an unfair di-

vision of the electoral districts in a State, made in the interest of one of the political parties. The word was coined in 1812, though the practice probably originated earlier. At that time the Federalist and Republican parties in Massachusetts were nearly evenly balanced in numerical strength, but the Republicans took advantage of a temporary majority in the Legislature to divide the State into new Senatorial districts in such a manner that those sections which gave a large number of Federalist votes might be brought into one district. Previously each county had constituted a Senatorial district, and the power of rearranging old districts or creating new ones, bestowed on the Legislature by the State Constitution, had never been exercised. Elbridge Gerry (q.v.) was at that time Governor, and through his signature, though he seems not to have wholly approved the measure, the work of the Legislature became a law. The form of one of the districts into which Essex County was divided was somewhat like that of a monstrous animal, and when some one suggested that it looked like a salamander, the name 'gerrymander' was given to it, instead. The passage of the law caused a great outcry from the Federalists, and early in 1813, this party having again secured a majority and elected a Governor (Caleb Strong) to succeed Gerry, the law was repealed. The device, however, has since been repeatedly used in various States. For an account of the origin of the term, consult Dean, "The Gerrymander," in the *New England Historical and Genealogical Register*, vol. xlv. (Boston, 1892):

GERS, zhâr. An interior department in the southwest of France, formerly portions of the provinces of Gascony and Guienne (Map: France, G 8). Area, 2425 square miles. Population, in 1896, 246,647; in 1901, 238,448. While the surface is hilly, its highest point does not exceed 1300 feet. Its principal rivers are the Gers, the Adour, Save, Gimone, and Bayse. Over 15 per cent. of the surface is devoted to the cultivation of the grape, from which large quantities of ordinary brandy and wine are manufactured. Wheat, oats, and flax are extensively grown. Other manufactures besides brandy and wine are woolens, leather, porcelain, glass, and bricks. Capital, Auch.

GERSAU, gër'sou. A health resort of Switzerland, situated in the Canton of Schwyz on the northern bank of Lake Lucerne (Map: Switzerland, C 2). The situation of the place is very picturesque and its equable and mild climate makes it a very desirable resort for invalids. The total population of the commune is about 2000. For four centuries after 1390 Gersau was entirely independent, forming the smallest republic in Europe. At the formation of the Helvetic Republic in 1798 Gersau became a part of the Canton of Waldstätten, and was subsequently (1803) incorporated with the Canton of Schwyz. Population, in 1888, 1816; in 1900, 1887.

GER'SHOM, or **GER'SHON**. A name given to two individuals in the Old Testament. (1) The first-born son of Moses and Zipporah, according to Ex. ii. 22; xviii. 3. In Judges xviii. 30, Gershom, or Gershon, is said to be the father of Jonathan, the priest officiating at the sanctuary of Dan (see HIGH PLACE), and the son of Manasseh or Moses. The only difference between these two names when written with the Hebrew

characters is the letter *nun*. While Manasseh is found in many manuscripts, most frequently the *nun* is put above the line, and in some cases it has been added by a later hand. Most of the ancient versions read Manasseh; but some manuscripts of the Greek version and the Latin Vulgate read Moses. It is therefore difficult to determine what the original reading was. Evidently the priesthood at Dan traced its origin either to Manasseh or to Moses, or to both at different periods. As the thirteen cities assigned to the Levitic clan of the Gershonites were all in Eastern Manasseh, Issachar, Asher, and Naphtali (Josh. xxi. 27, 33), it is possible that the Gershonite priesthood at Dan considered itself of Manassite origin, and even that the cult in this place was once devoted to the divinity who afterwards became the eponymous hero of the tribe of Manasseh. A claim to Mosaic descent would then be a later development. Another view is that the suspended *nun* is a device to gloss over the unpleasant fact that a grandson of Moses was priest at a temple where a Yahweh image was worshipped. The priestly legislation knows of no sons of Moses in the priesthood. (2) The first-born son of Levi, according to Ex. vi. 16; Num. iii. 17; I. Chron. vi. 1, 16; xxiii. 6. In reality this Gershon is the eponym of a Levitic family in the Persian and Greek period. In the sketch of the tabernacle in the wilderness, the Gershonites are the carriers of curtains, coverings, screens, and hangings belonging to this movable sanctuary. In the narrative of David's reign they figure as musicians belonging to the family of Asaph. It is probable that the Gershonites furnished some of the musicians as well as some of the janitors for the second temple. Whether they were descendants of the Gershonites who once were priests at Dan is not certain, but it is quite probable.

GERSON, zhâr'sôn', JEAN CHARLIER DE (1363-1429). An eminent French scholar and divine of the closing period of the Middle Ages. He was born at Gerson, in the Diocese of Rheims, December 14, 1363. He entered the University of Paris, and studied theology under the celebrated Pierre d'Ailly. Here he rose to the highest honors of the university, and ultimately to its chancellorship (1392), having acquired by his extraordinary learning the title of 'the Most Christian Doctor.' During the contests which arose out of the rival claims of the two lines of pontiffs in the time of the Western Schism (q.v.) the University of Paris took a leading part in the negotiations for union, and Gerson was one of the most active supporters of the proposal of the university for putting an end to the schism by the resignation of both the contending parties. He visited the other universities, in order to obtain their assent to the plan proposed by that of Paris. But although he had the satisfaction to see this plan carried out in the Council of Pisa (1409), it failed to secure the desired union. In a treatise inscribed to his friend Pierre d'Ailly, he renewed the proposal that the rival pontiffs (now not two, but three, since the election of John XXIII., at Pisa) should be required to resign; and in the new council which met at Constance in 1414, he was again the most zealous advocate of the same expedient of resignation. It is to him also that the great outlines of the plan of Church reformation, then and afterwards proposed, are due. (See CONSTANCE, COUNCIL OF.)

But his own personal fortunes were marred by the animosity of the Duke of Burgundy and his adherents, to whom Gerson had become obnoxious, and from whom he had already suffered much persecution, on account of the boldness with which he had denounced the murder of the Duke of Orleans. To escape their vengeance, he was forced to remain in exile; and he retired from Constance (1418) in the disguise of a pilgrim, to Rattenberg, in Bavaria, where he composed his celebrated work, *De Consolatione Theologicæ*, in imitation of that of Boëthius, *De Consolatione Philosophiæ*; later he went to Neuburg. It was only after the lapse of two years that he was enabled to return to France and take up his residence in a monastery at Lyons, of which his brother was superior. He devoted himself in this retirement to works of piety, to study, and to the education of youth. He died in Lyons July 12, 1429. His works fill five volumes in folio. Among the books formerly ascribed to him was the celebrated treatise *De Imitatione Christi*; but it is no longer doubtful that the true author is Thomas à Kempis (q.v.). The best and most complete edition of his works is by Dupin (Antwerp, 1706). Consult: his life by Schwab (Würzburg, 1858); Bess, *Zur Geschichte des Konstanzer Konzils* (Marburg, 1891); Creighton, *History of the Papacy*, vols. i. and ii. (London, 1882).

GERSON, gër'son-y', WOJCIECH (1831-1901). A Polish historical painter, born at Warsaw. He began his studies at the School of Art, and continued them at the Academy of Saint Petersburg, and under Léon Cogniet in Paris. Subsequently appointed professor in his native city, he exercised a far-reaching influence upon the promotion of art in Poland as the master of many of the distinguished Polish painters of the day, and as the founder of the Art Society in Warsaw. He was a member of the Saint Petersburg Academy. Among his highly valued pictures, noted for thoughtful conception and masterly finish, may be mentioned: "Conversion of the Slavs to Christianity in the Tenth Century;" "Queen Hedwig in the Castle at Cracow;" "Count Casimir the Righteous;" "Copernicus in Rome;" "Haughty Queen Rixa of Poland," besides many other episodes from Polish history.

GERSONIDES, gër-sôn'î-déz, or LÉON DE BAGNOLS (c.1288-1344). A distinguished Jewish philosopher, physician, astronomer, and commentator, known in Jewish literature as Levi ben Gerson. He was born in Arles, of a family of scholars. He made many accurate observations in astronomy, and wrote commentaries on parts of the Bible. His best work is called *Milkhamot Adonai*, "Wars of the Lord," and is a daring philosophical treatise. Though his philosophy is based on that of Maimonides, it passes beyond this writer in various points. His works gained a reputation among Christian scholars, and certain portions were translated into Latin by order of Pope Clement VI. (1342). He died at Perpignan. Consult: Joel, *Levi ben Gerson als Religionsphilosoph* (Breslau, 1862); Winter and Wänsche, *Jüdische Litteratur*, vol. ii. (Treves, 1894).

TERSOPPA (gër-söp'pâ) **FALLS**. A celebrated cataract on the Sharawati River, India, 30 miles southeast of Honawar at the mouth of the river on the west coast (Map: India, B 6).

It consists of four falls known as the Great, the Roarer, the Rocket, and the *Dame Blanche* or White Lady, names descriptive of their general features. They descend on three sides of an immense chasm 600 feet wide, the Great Fall leaping down 829 feet into an enormous pool of great depth.

GERSTÄCKER, gër'stèk-ër, FRIEDRICH (1816-72). A German romancer of adventure. Born in Hamburg, May 10, 1816, the son of an opera singer, and left early an orphan, he came to the United States in 1837, and for seven years wandered over the country supporting himself as a jack of all trades and for some time as a hunter. In 1843 he returned to Germany and turned his experiences to profitable account in the widely popular *Streif- und Jagdzüge* (1844); *Die Regulatoren in Arkansas* (1846); *Die Flusspiraten des Mississippi* (1848); and many other volumes of similar character. In 1849 Gerstäcker went again to America and visited also Polynesia and Australia, basing on this voyage his *Tahiti*, and an Australian story, *Die beiden Sträflinge*, both of which are among his best work. In 1860 he went to South America, and in 1862 accompanied Duke Ernest of Saxe-Coburg-Gotha to Egypt and Abyssinia. In 1867-68 he revisited the United States, traveling also in Mexico, Ecuador, Venezuela, and the West Indies, and he gave a vivid account of his experiences in *Neue Reisen* (1868), and in several novels, *Die Missionäre* (1868), *Die Blauen und die Gelben* (1870), and others. Gerstäcker's gifts of description are very considerable, his character drawing is vivid and realistic, his style straightforward and unstudied. Many of his stories have been popular in English translations. He died in Brunswick, May 31, 1872.

GERSTÄCKER, KARL EDUARD ADOLF (1828-95). A German zoölogist. He was born and educated in Berlin, where in 1857 he was appointed lecturer on zoölogy at the university and director of the entomological collection in that institution. During the last twenty years of his life he was professor of zoölogy at Greifswald. His principal works include: *Entomographien* (vol. i. 1858); *Zur Morphologie der Orthoptera Amphibiotica* (1873); *Die Wanderheuschrecke* (1876); and *Der Coloradokäfer* (1877).

GERSTENBERG, gër'sten-bèrk, HEINRICH WILHELM VON (1737-1823). A German poet, dramatist, and critic, born at Tondern (Schleswig). He was educated at Jena, entered the Danish Army, became a captain of cavalry in 1763, and in 1766 was retired from the service on half pay. In 1771 he resigned, in 1775 was appointed Danish consul at Lübeck, and from 1785 to 1812 was legal director of the royal lottery at Altona. He is known for three works of important influence in German letters. His *Gedicht eines Skalden* (1766) introduced a revival of the literary use of Teutonic mythology and the heroic age of German civilization. His tragedy *Ugolino* (1768), based on Dante, though declared by Lessing essentially undramatic, attracted much attention by its skillful management of plot and character. His *Briefe über Merkwürdigkeiten der Litteratur* (1766-70) contributed much in Germany toward a just estimate of Shakespeare, and by its complaint against the reigning formality in German literature indirectly helped to prepare the way for the 'Sturm und Drang.' A

collection of his *Vermischte Schriften*, edited by himself, appeared in 1815.

GERSTER, gër'stër, ETELKA (Mme. GARDINI) (1857—). A Hungarian singer, born at Kaschau. After studying at the Vienna Conservatory under Marchesi she made her début in 1876 as Gilda in *Rigoletto*, subsequently singing with great success in Marseilles, Genoa, and Berlin. In 1877 she married Pietro Gardini. The following year (and again in 1883 and 1887) she made a tour of the United States, and also sang in the principal European cities. Her voice, a high soprano, was remarkable for its great flexibility and brilliancy. In 1896 she opened a singing school in Berlin.

GERSTNER, gër'st'nër, FRANZ ANTON VON (1793-1840). An Austrian engineer, a son of Franz Josef von Gerstner (1756-1832). He was born and educated at Prague, and in 1818 was appointed professor of practical geometry at the Polytechnic Institute, Vienna. He went to England several times to investigate railroad-building in that country, especially the road from Liverpool to Manchester, which was at that time in course of construction. In 1823-24 he made the plans of the Budweis-Linz (horse-power) Railroad, the first to be constructed on the Continent of Europe (opened 1832). He built the road from Saint Petersburg to Tsarskoye-Selo, and organized other railroads in Russia. In 1838 he visited America, where he examined the railroads then either built or building in the United States. Two years after his sudden death in Philadelphia, a description of his American tour was published by his wife under the title *Beschreibung einer Reise durch die Vereinigten Staaten von Nord-Amerika* (1842). A similar work, but more technical in character, embodying the investigations of Gerstner in America, was edited in 1842 by L. Klein, under the title *Die inneren Kommunikationen der Vereinigten Staaten von Nord-Amerika*, an interesting work in two volumes on the means of communication then existing in the United States.

GERTRUDE. (1) A Belgian saint (626-59), whose fête is celebrated on March 17th. She was the daughter of Pepin of Landen and Ida of Aquitaine. Dagobert I. attempted to force her to marry him, but she eluded his efforts and, taking the veil, became abbess of Nivelles in Brabant. A number of churches in Belgium are dedicated to her. (2) SAINT GERTRUDE of Eisleben (1256-1311) entered the Convent of Helfta when five years old and became a great student. Her mystical visions began in 1271, and from that time she gave herself particularly to the study of the Scriptures. Her visions she describes in *Insinuationes Divinæ Pietatis* and *Exercitia Spiritualia* (1602), often reprinted. Her fête is kept on November 15th.

GERTRUDE. (1) The weak-minded Queen of Denmark in Shakespeare's *Hamlet*, who marries the fratricide Claudius, and is poisoned by a deadly draught prepared for her son. (2) The extravagant goldsmith's daughter in Chapman, Marston, and Jonson's *Eastward Ho!*

GERTRUDE OF WYOMING. A pathetic and graceful, though not flawless, poem by Thomas Campbell which appeared in 1809, and suggested a notable conversation between Scott and Irving concerning the author's limited poetic achievements in proportion to his undoubted powers and promise.

GERUSALEMME LIBERATA, jā-rōō'sā-lēm'mā lē'bā-rā'tā (lt., Jerusalem Delivered). A famous poem by Torquato Tasso (1581), in 24 books, the narrative of real and fictitious events connected with the First Crusade and the deliverance of Jerusalem under Godfrey of Bouillon. English translations were published by Fairfax in 1600 and by James in 1865.

GÉRUZEZ, zhā'rōō'zā', EUGÈNE (1799-1865). A French critic, born at Rheims. He was the nephew of Jean Gérúzez (1763-1830) the author, and held the chair of eloquence at the Sorbonne for nineteen years. Besides his contributions to the best journals of the time, he wrote a number of valuable critical works, such as *Histoire de l'éloquence politique et religieuse en France au XIVème, XVème et XVIème siècles* (1837-38); *Essais d'histoire littéraire* (1838); *Histoire de la littérature française pendant la Révolution* (1859); and *Histoire de la littérature française depuis ses origines jusqu'à la Révolution* (1861).

GERVAIS, zhār'vā', ALFRED ALBERT (1837—). A French admiral, born at Provins. After serving in the Crimean, Chinese, and Franco-German wars, he was appointed captain in 1871. In 1884 he became chief of staff in the Naval Department at Paris, and three years later was advanced to the rank of rear-admiral. He was appointed vice-admiral in 1892, commanding admiral of the Mediterranean squadron in 1896, and in 1900 commanded the canal squadron which received the Czar at Dunkirk.

GERVAIS, FRANÇOIS LOUIS PAUL (1816-79). A French paleontologist, born in Paris. He graduated there as doctor of sciences and of medicine, and in 1835 was appointed assistant to Blainville, professor of comparative anatomy at the Paris Museum. In 1845 he became professor of zoölogy and comparative anatomy in the Faculty of Sciences of Montpellier, in 1865 a professor in the Faculty of Sciences of Paris, and in 1868 professor of comparative anatomy at the Museum. He was appointed a correspondent of the Institute of France in 1861, and elected a foreign member of the Geological Society of London in 1875. He early began the study of the 'insecta aptera' of Linnaeus, particularly the myriapods, and prepared the *Histoire naturelle des insectes aptères* (1844-47), comprising volumes three and four of the *Suites à Buffon* begun by Walckenaer. It is however, for his researches concerning the Tertiary mammalia that he is best known. In this field his most important contributions are his *Histoire naturelle des mammifères* (1854-55), and *Zoölogie et paléontologie générales* (1867). The *Recherches sur les mammifères fossiles de l'Amérique Méridionale* (1855) should also be mentioned.

GERVASE (jēr'vāz) OF CANTERBURY (1141?-1210?). An English chronicler. He became a monk of Christ Church, Canterbury, in 1163, and sacristan in 1193, and seems to have spent all the rest of his life there. His earliest known work is a *Tractatus de Combustione et Reparatione Cantuariensis Ecclesie*, being an account of the conflagration of 1174, and of the subsequent process of rebuilding, written probably in 1185. This was followed by *Imaginatio Gervasi Quasi Contra Monachos Cantuariensis Ecclesie*, and other treatises containing a detailed relation of the clerical disputes at Canterbury. Gervase's *Chronica* of the times of Stephen,

Henry II., and Richard I., probably begun about 1188, brings the history down to the death of the last-named King. His *Actus Archiepiscoporum Cantuariensium* comes down to the death of Hubert Walter in 1205. His *Gesta Regum* extends from Brutus to 1210, and is continued by another author to 1328. In addition, he wrote a *Mappa Mundi*, a survey of the counties of England. Gervase died, probably, very soon after 1210. All of his works have been edited by Stubbs, in two volumes, Rolls Series (1879-80). The preface contains a full account of his life.

GERVASE OF TIL'BURY. A mediæval writer on historical and philosophical subjects, born probably at Tilbury, in Essex, England. He seems to have been brought up in Italy, and to have studied and taught at Bologna. He was at Venice in 1177 when Frederick I. and Alexander III. met. He was at the English Court about 1183, and later went to Sicily. In 1190 he was at Salerno. He entered the service of Otho IV., who made him Marshal of the Kingdom of Arles, and to whom he dedicated his only extant work, the *Otia Imperialia*. This was written about 1211-1214, and is divided into three parts. In the first Gervase discusses the events in the early chapters of Genesis, the origin of music, etc.; in the second he treats of history, geography, and politics; in the third, of marvels. The last is exceedingly valuable for the light it throws upon the beliefs of the age. This work was published (although not completely) in Leibnitz, *Scriptores Rerum Brunsvicensium* (Hanover, 1707-10).

GERVEX, zhār'vā', HENRI (1848—). A French painter, born in Paris. He was the pupil of Cabanel, Brisset, and Fromentin, and first exhibited in 1873. His "Satyr Playing with a Bacchante" (1874) is in the Luxembourg. After this date his works were more often of contemporary life. These include "Communion at the Church of the Trinity;" "Rolla," a fine nude, excluded from the Salon of 1878; "The Return from the Ball;" and "Dr. Péan at l'Hôpital Saint Louis," a realistically treated scene in an operating room, one of the first works in this genre to be represented in modern art. In this, as in all his works, the technique is excellent, and the color quiet and harmonious. With Blanchon he produced four decorative paintings of civil subjects for the Mayor's office of the nineteenth arrondissement. His portraits are notable; particularly "The Séance of the Jury of Painting" (1885) in the Luxembourg. He received second-class medals in 1874 and 1876, and was decorated with the cross of the Legion of Honor in 1889.

GERVINUS, gēr-vē'nōōs, GEORG GOTTFRIED (1805-71). A German historian and literary critic. He was born at Darmstadt, May 20, 1805, studied, after some years devoted to commercial pursuits, at Giessen and Heidelberg, taught at Frankfort, and became professor at Heidelberg in 1835 and at Göttingen in 1836. He had already printed some historical work of minor value, but now began the publication of what came at last to be known as his *Geschichte der deutschen Dichtung* (1835-42), which has passed through many editions. In 1837 he, in common with six other liberal professors, lost his chair by a protest against the suspension of the Hanoverian Constitution, was banished, and traveled for a time in Italy. In 1844 he received a call

to Heidelberg as professor. Some years were now given to political writing in pamphlets and periodicals in the interest of constitutional liberty, but the failure of liberal hopes in 1848 brought him back to literature. He wrote four volumes on *Shakespeare* (1849-50); a liberal and very influential *Geschichte des neunzehnten Jahrhunderts* (1853-66); *Händel und Shakespeare* (1868); and *Händel's Oratorientexte* (1873). He died at Heidelberg, March 18, 1871, deeply dissatisfied with the manner in which Prussia had brought about the unification of Germany.

GERWIG, gër'vîk, ROBERT (1820-85). A German railroad engineer, born at Karlsruhe and educated at the Polytechnic Institute in that city. In 1866 he projected the railroad through the Black Forest, and completed that difficult piece of engineering, with its numerous tunnels, in seven years. From 1872 to 1875 he had charge of the building of the Saint Gothard Railroad, which, together with Beckh, he had planned.

GERYON, jër'i-on, or **GERYONES**, jê-rî'ô-nêz (Lat., from Gk. Γηρυών). In Greek mythology, the son of Chrysaor and Callirhoë, a giant with three heads and three bodies, the ruler of the western island Erythia, where he kept a great herd of cattle. They were guarded by the herdsman Eurytion and by a monstrous two-headed dog Orthros, both of whom Hercules slew, together with Geryon himself, when he went to carry off the cattle as one of his twelve labors.

GESELLSCHAFT DER ÖSTERREICHISCHEN MUSIKFREUNDE, ge-zêl'shäft dêr ô'ster-rîk'îsh-en mû-zêk'froi'n'de (Ger., Society of Austrian Friends of Music). One of the oldest orchestral organizations in Europe. It was the direct outcome of a festival concert given in Vienna on November 29, 1812, in aid of the sufferers from the war with France. The work performed was Handel's *Timotheus*, which was received so favorably that the performance was repeated December 3d. Then Sonnleithner issued a circular urging all persons interested in music to form a society for the performance of larger works. Many lovers of the art responded, so that in 1814 the statutes of the new society were approved by the Emperor Francis I. At the head of this organization was a 'Protector,' who was always a nobleman. The first protector was Beethoven's pupil, the Archduke Rudolf. In 1835 the office of protector was abolished, and a president elected, who for many years was also a nobleman. But in 1867 artistic considerations led to the election of the citizen Dr. F. Egger. For the first five years the programmes consisted of oratorios; then mixed programmes were substituted, and even choral works were not excluded. All members were on an equal footing. The conductor was chosen by lot from among the members, many of whom were amateurs. Symphonies were performed in a curious and inartistic manner, Italian arias being interspersed between the different movements until as late as 1846. Not before 1824 was a symphony (the *Eroica*) performed consecutively and in its entirety. After 1840 the artistic standard of the society declined. Programmes were arranged with bad taste, the execution became careless, and new works and composers were ignored. The establishment of the Akademie der Tonkunst in 1851 led to a radical reform of the Gesellschaft, Hellmesberger

being then elected a conductor. This ambitious and energetic musician filled the places of amateurs by professional musicians, offered artistic programmes, and brought the orchestra to a high degree of technical efficiency. New composers now also found a ready hearing. This work was continued by the new conductor Herbeck, who was elected in 1859, and ever since its concerts have been among the musical events of Vienna. Among the conductors of the Gesellschaft have been Brahms and Richter.

GESELSCHAP, ge-zêl'shâp, EDUARD (1814-78). A German painter, born at Amsterdam. He was a pupil at the Academy of Düsseldorf, and at first his subjects were historical, but afterwards he became more successful as a genre painter. His works include: "Die Erscheinung des Christkinds" (1850); "Der Niklas—Abend" (1851); "Die Singschule" (in the Hanover Museum); "Der Weihnachtsmorgen" (in the Stockholm Museum); and "Musikalische Abendunterhaltung" (1865), Cologne Museum. In these pictures his lamplight and interior effects are cleverly executed.

GESELSCHAP, FRIEDRICH (1835-98). A German historical painter, born at Wesel. He studied at the Dresden Academy, then under Mintrop in Düsseldorf, and from 1866 to 1871 in Rome, where he gave his special attention to the monumental fresco paintings of Raphael and Michelangelo. In Berlin he became more widely known by his competitive designs for the decoration of the Kaiserhaus in Goslar (1877), and sprang into fame with his grand compositions of the mural paintings in the Ruhmeshalle (Hall of Fame) in Berlin, executed in 1882-90, and representing in numerous ideal figures: "A Roman Triumphal Progress;" "War;" "Peace;" "Walhalla;" and "The Reërection of the German Empire." In 1882 he was elected a member, and in 1884 Senator of the Berlin Academy, and received the title of professor. Consult Donop, *Friedrich Geselschap und seine Wandgemälde in der Ruhmeshalle* (Berlin, 1890).

GESENIUS, ge-zê'nê-us, WILHELM (1786-1842). One of the greatest German Orientalists and biblical scholars. He was born at Nordhausen, and educated at the gymnasium of his native town, and at Helmstedt and the University of Göttingen. After having been for a short time teacher in the pädagogium at Helmstedt, he became, in 1806, a theological *repetent*, or tutor, in Göttingen, and in 1809 was appointed professor in the gymnasium of Heiligenstadt. In 1810 he received a call to Halle as assistant professor of theology, and was made full professor in the following year. In 1820 and again in 1835 he traveled extensively, making investigations in various libraries. In 1827 he was called to Eichborn's position at Göttingen, but declined the call. In 1810-12 he published a *Hebrew and Chaldaic Dictionary of the Old Testament*. In 1813-14 appeared his *Hebräisches Elementarbuch*, consisting of a Hebrew grammar and a reading book, which were also published separately. This dictionary and grammar, as they have been successively revised and translated (13th ed. of the lexicon ed. by Buhl, 1899; 27th ed. of grammar ed. by Kautsch, 1902), are still standard books of reference, not only throughout Germany, but also in Great Britain and America. Of Gesenius's numerous other

writings, the following may be mentioned: *Kritische Geschichte der hebräischen Sprache und Schrift* (1815); *De Pentateuchi Samaritani Origine* (1815); a translation of the prophet Isaiah with commentary (1820-21); *Ausführliches grammatisch-kritisches Lehrgebäude der hebräischen Sprache* (1817); and *Scripturæ Linguæque Phœnicæ Monumenta* (3 vols., 1837). His larger lexicon of the Hebrew language, *Thesaurus Philologus Criticus Linguae Hebrææ et Chaldææ Veteris Testamenti*, which would undoubtedly have been his greatest achievement, but which was interrupted by his death, was completed in 1858 by E. Rödiger. Gesenius's great merit was his placing the study of Semitic languages on a sound philological basis. His method of interpreting the Old Testament was rationalistic. Both Semitic philology and biblical exegesis have advanced far beyond the point to which he carried them; nevertheless, his methods and principles underlie much of the work that has been done since his time, and that is still being done. Consult Hayne, *Gesenius, eine Erinnerung für seine Freunde* (Berlin, 1842).

GESHUR, gē'shūr. (1) An Aramean State, east of the Jordan, probably in the southern part of modern Jaulan. Its northern neighbor was Maacah. According to I. Chron. ii. 23, the latter took certain villages belonging to the Israelitish clan of Jair in Bashan. In Deut. iii. 14, Joshua xii. 5, Geshur and Maacah are said to border on the territory of Og of Bashan. It is not impossible that Ishbaal, the son of Saul (c. 1033-1026 B.C.), held possession of Geshur (II. Sam. ii. 9, Pesh., Vulg.), though it was subsequently independent. Many scholars hold that it was of this Geshur that Talmi, David's contemporary, was king. (2) In Joshua xiii. 2, and I. Sam. xxvii. 8, a Geshur is mentioned, but it seems to have been situated in Southwest Palestine. This Geshur was attacked by David from Ziklag. As Talmi also occurs as the name of a Hebronite giant (Judges i. 10), and Maacah as the name of a concubine of Caleb (I. Chron. ii. 48), it is possible that King Talmi of Geshur (II. Sam. iii. 3), whose daughter Maacah became David's wife and Absalom's mother, may have belonged to this southern clan.

GESNER, gēs'nēr, ABRAHAM (1797-1864). An American geologist, born in Nova Scotia. He studied medicine in London, and took his degree in 1827. Eleven years later he became geologist of the Province of Nova Scotia. In 1846 he made experiments on burning oil distilled from petroleum and on asphalt from Trinidad. Subsequently he discovered kerosene oil, and introduced its use in the United States. He traveled much in this country, and settled in New York City in 1852, but died at Halifax, N. S. His writings are: *Treatise on Coal, Petroleum, and Other Distilled Oils* (1860); *Remarks on the Geology and Mineralogy of Nova Scotia*; and *Geology of New Brunswick and Prince Edward's Island*; articles on "The Gypsum of Nova Scotia" (vol. v.), "Elevations and Depressions of the Earth in North America" (vol. xvii.), and "Petroleum Springs in North America" (vol. xviii.), in the *Journal of the London Geological Society*; and, in its *Proceedings*, a "Geological Map of Nova Scotia" (vol. iv.).

GESNER, JOHANN MATTHIAS (1691-1761). A distinguished German classical scholar. He

studied at the University of Jena, and in 1714 published a work on the *Philopatris*, ascribed to Lucian. In 1715 he became librarian and associate rector at Weimar; in 1729, rector of the gymnasium at Ansbach; and in 1730, rector of the Saint Thomas School at Leipzig, where he was associated with Johann A. Ernesti and Johann Sebastian Bach. On the foundation of the University of Göttingen he became professor of rhetoric, and subsequently librarian also. He did much to bring about a revival of the study of Greek in Germany, and used his influence to induce the German universities to base their instructions in Greek and Latin on the classical authors. He published editions of Quintilian (1738), Pliny the Younger (1739); Claudian (1759), and the *Scriptores Rei Rusticæ* (1735); but his greatest work is the *Novus Linguæ et Eruditionis Romanæ Thesaurus* (1749). Consult Ernesti, *Narratio de Gesnero* (Leyden, 1762).

GESNER, KONRAD VON (1516-65). A Swiss naturalist, born at Zurich. He studied Greek, Latin, Hebrew, and medicine at Zurich, Strassburg, Bourges, Paris, Montpellier, and Basel, at the last place taking his medical degree. He returned in 1541 to Zurich as professor of physics, and practiced in that city as physician until his death from the plague. Gesner collected and described animals and plants with the greatest zeal throughout his entire life, and wrote voluminously on many subjects. His most important work is *Historia Animalium* (1551-58), in which he intended to describe every known animal. The first book treats of viviparous, the second of oviparous quadrupeds, the third of birds, and the fourth of aquatic animals. The fifth book, on serpents, and the sixth, on insects, he left incomplete. He was preparing a description of all known plants at the time of his death. Gesner was the most important naturalist of his age. He performed the useful work of bringing together all that was known of animals and plants, including those of the recently discovered countries in the New and the Old World, and although he made no attempt to arrange them in a natural system, his work, together with the similar work of Aldrovandi (q.v.), formed the basis for the fruitful investigations and generalizations of the two following centuries.

GESNERACEÆ, gēs'nēr-ā'sē-ē (Neo-Lat. nom. pl., named in honor of Konrad von Gesner). A family of dicotyledonous plants, mostly herbs or shrubs, comprising about 70 genera and 700 species, natives of warm countries, distinguished from the Scrophulariaceæ by the parietal placenta of the ovary. Some authors divide the family into two tribes: Gesneraceæ with an inferior ovary and Cyrtandraceæ with a superior ovary. The chief genera of the former are Niphæa, Achimenes, and Rhytidophyllum; of the latter, which comprises a majority of the species, Calumnea, Eschynanthus, Besleria, Didymocarpus.

GESSI, jēs'sē, ROMOLO (1829-81). An Italian explorer, born at Ravenna. After serving in the Austrian Army, he was sent as an officer in the service of Egypt to the Sudan, where Gordon employed him to explore the Upper Nile and the Albert Nyanza (1876). Accompanied by Matteucci, he tried to enter the country of the Gallas, but without success. In 1880 he put down the insurrection raised by Suleiman Pasha in South-

ern Darfur, and became Governor of the Province of Bahr-el-Ghazal. He died at Suez, of malarial fever, May 1, 1881, and left a volume descriptive of his adventures, *Sette anni nel Sudan egiziano* (1891).

GESSELER, gēs'lēr. An Austrian official in the forest cantons of Switzerland, according to traditions connected with William Tell (q.v.). His oppressive edicts and wanton cruelty so enraged the inhabitants that a conspiracy was formed against him, and he was shot by Tell in a narrow pass near Küssnacht. He is a wholly legendary character.

GESSENER, gēs'nēr, LUDWIG (1828-90). A German jurist. He was born at Axthausen, and was educated at Halle, Heidelberg, and Berlin. He held important positions in the German Ministries of War, State, and Foreign Affairs, and wrote a number of valuable contributions to marine and international law, including: *Das Recht des neutralen Seehandels* (1855); *Le droit des neutres sur mer* (2d ed. 1876); *Zur Reform des Kriegs-Seerechts* (1875); "Die Staatsverträge im allgemeinen." in Holtzendorff's *Handbuch des Völkerrechts* (1887).

GESSENER, SALOMON (1730-88). A Swiss poet, painter, and etcher, very popular in his day as a writer and representative of the idyllic taste of his generation. He was born in Zurich, April 1, 1730. His first noteworthy piece, *Lied eines Schweizers an sein bewaffnetes Mädchen* (1751), was followed by *Daphnis* (1754), *Idyllen* (1756), and, most famous of all, *Der Tod Abels* (1758), which he called "a sort of idyllic prose pastoral." Gessner's work is throughout insipidly sweet and monotonously melodious; yet it exactly suited the taste of a generation nursed on Rousseau. The idylls had a European influence, and appeared in seven languages. He died in Zurich, March 2, 1788. Gessner's *Works* were frequently published, last in 1841. There is a French translation in three volumes (1786-93). Gessner's *Life*, by Höttinger, appeared in 1796; his *Correspondence with His Son* in 1801. For Gessner's literary influence, consult *Texte, J. J. Rousseau and Literary Cosmopolitanism* (New York, 1897).

GESTA ROMANORUM, jēs'tā rō'mā-nō'rūm (Lat., the deeds of the Romans). The title of one of the most popular collections of anecdotes in the later Middle Ages. The stories are written in Latin, and supposedly are based on Roman history, though in fact there is very little actual history contained in them. Probably at an early date there were collections of stories taken from Roman history, and used as texts for sermons. These stories were then put together for the express purpose of being moralized, and finally appeared under the title of *Gesta Romanorum Moralizata*, or something similar. No manuscripts have come down, and the three earliest editions we have were printed between 1472 and 1475, and contained altogether 181 stories, which had originated, according to Oesterley, in England at the end of the thirteenth century. The stories are short and destitute of rhetorical ornaments, and have neither dialogue nor tragic incident. Their attractiveness lies in their child-like simplicity. The stories were very widely read, and were translated into many languages. Shakespeare's *King Lear* is based upon one of the tales in the *Gesta Romanorum*, and a part

of the *Merchant of Venice* comes from the same source. Schiller's *Der Gang zum Eisenhammer* is also one of the stories of this collection. Furthermore, Chaucer, Gower, and others owed considerable to these simple stories. The best critical edition is that of Oesterley, *Gesta Romanorum* (Berlin, 1872). A good English version with an introduction has been edited by Hooper, *Gesta Romanorum* (London, 1894).

GESTATION (Lat. *gestatio*, from *gestare*, frequentative of *gerere*, to carry). The term applied in physiology to the period that intervenes in the mammalia between impregnation and the bringing forth of the young. The length of gestation and the number of young produced at a birth vary extremely in different mammals, but usually stand in an inverse ratio to one another. Thus, in the larger Herbivora, as, for example, the elephant, the horse, the ox, and the camel, the female seldom produces more than one at a time, but the period of gestation is long; while in the smaller ones the progeny is numerous, but the period of gestation is only a few weeks. In the elephant the period of gestation extends over 21 or 22 months; in the giraffe it is 14 months; in the dromedary it is 12 months; in the mare upward of 11 months; in the tapir, between 10 and 11; in the cow, 9; and in many of the larger deer, somewhat more than 8 months. In the sheep and goat the period is 5 months. In the sow, which produces a numerous litter, the period is 4 months. In the Rodentia the progeny is numerous and imperfectly developed, and the period of gestation is comparatively short; in the beaver, one of the largest of the order, it is 4 months; in the rabbit and hare, from 30 to 40 days; in the dormouse, 31 days; in the squirrel and rat, 4 weeks; and in the guinea-pig, 3 weeks or less. The young of the Carnivora, like the young of the Rodentia, are born with their eyes closed, and in a very immature condition; and even in the larger Carnivora the period of gestation is far shorter than in the larger Ruminantia or Pachydermata; it is 6 months in the bear; 108 days in the lion (the period in this animal is stated by Van der Hoeven at 3 months); 79 days in the puma; 62 to 63 days in the dog, the wolf, and the fox; and 55 or 56 days in the cat. Of the Marsupialia, gestation in the kangaroo lasts 39 days, in the opossum 26 days. Of the Quadrumana, the period of gestation lasts 7 months in the monkey, which bears one, rarely two, young at term. Of the Cetacea, the whale's normal pregnancy lasts 10 months. Domesticated animals breed oftener than those in a wild condition. Wild pigeons breed twice, domesticated pigeons six or more times a year.

In woman, the accepted period of gestation is 275 days from insemination, or 280 days (on an average) from the last day of the previous menstruation. In a young mother, the first pregnancy may be much shorter than succeeding pregnancies. Prolongation of gestation to 300 days is possible, counting from the last menstrual flow. French law admits the legitimacy of a child born 300 days after the separation of the parents; Scotch law allows 10 months; English law allows the lapse of 11 months between the death or departure of the husband and the birth of a legitimate child; in the United States it was decided, in the case of the *Commonwealth vs. Porter*, that a child born 317 days after the absence of the father began was not a bastard.

GESTE, zhâst, CHANSONS DE. See CHANSONS DE GESTE.

GESTURE (ML. *gestura*, from Lat. *gerere*, to carry, to conduct). An expressive movement (see **EXPRESSION**) which is intended to convey some thought or emotion in visible form. Psychologically considered, gesture evinces two ultimate forms—the demonstrative and the imitative. Demonstrative gestures are capable of but little development, though their range has extended from the indication of present objects to that of dimensions in space and time, and of the organs and functions of the body. The imitative gestures, on the other hand, have undergone a long series of developmental changes. We have, first, the imitative gestures proper, or pictorial signs, in which, e.g. a house is indicated by the finger outline of walls and gable roof, and a room by an outlined square. Next in order stand the characterizing gestures, in which some feature or aspect of the object is made to do duty for the whole—a deaf-mute sign for 'man' is the movement of taking off the hat. Lastly, we find symbolic gestures, from which the element of direct imitation has altogether disappeared. These show all stages of refinement, from the sticking up of the forefingers above the ears to indicate stupidity (ass's ears), to the outward movement of the spread hand, that signifies 'be quiet,' or the crossing of the forefingers, by which the American Indian makes known his readiness to trade. Consult: Wundt, *Völkerpsychologie* (Leipzig, 1900); Tylor, *Early History of Mankind* (London, 1878).

GESTURE LANGUAGE. The communication of thought by bodily movements, excepting the use of the vocal organs in speech or exclamations. They are not confined to man alone, but are possessed by many other animals to a greater or less degree, and thus, together with exclamations which also occur to some degree among animals, gesture language is one of the most primitive modes of transferring ideas. That gesture is to some extent produced by speech deficiency is clear from the fact that individuals of mutually unintelligible vernaculars are obliged, in the absence of an interpreter, to communicate at first entirely by gestures, and that as their speech becomes intelligible the necessity for gestures steadily diminishes to a certain point. A certain amount of gesture language is imperative in connection with spoken language, and its refined employment is a mark of culture.

The gestures used as a form of language may best be divided into manifestive, demonstrative, and imitative. To this classification symbolic and comitative gestures are added by some scholars. Comitative gestures are but a subclass of the imitative, while symbolic gestures seem to be another subdivision of the imitative signs, and it is important to observe that in many instances the imitative gestures themselves may be derived ultimately from the manifestive group. The simplest class of gesture language is formed by the manifestive class, which is in the main emotive in character. Here belong such gestures as striking the breast, or pressing the head tightly between the hands in grief (apparently a sort of physical counter-irritant to mental pain); turning up of the nose in contempt (originally an expression of disgust at a foul odor); the backward thrust of the upraised hands with the palms

outward, to repel anything disagreeable or dangerous; the shrug of the shoulders to denote indifference or despair (primarily to express muscular adjustment to meet something which is inevitable); stamping the foot in rage (found also among animals, notably in an enraged bull; perhaps originally, as in the case of an angry lion lashing himself with his tail, an exciting stimulus of fury already aroused); and many others. The demonstrative gestures differ from the manifestive in being altruistic instead of egoistic—that is, they refer to others, and not to self. To this class belong such motions as the simple pointing gesture; the laying of the finger on one's own lips to enjoin silence in others; the light tapping of one's own forehead with the finger-tip to indicate that another person is deranged; the Neapolitan gesture to mark present time, in which the outstretched finger is pointed downward, or to show past time by directing the right thumb a little backward over the shoulder. In this class the gestures intended to apply to others are often really indicated on one's self from motives of decorum and the like. Certain demonstrative gestures seem to be modified manifestive signs, as the pointing with the finger. This gesture is probably originally of the same manifestive type as the pricking up of the ears of a horse, who sees something which excites his attention, while the transition from the one type to the other may be seen in the pointing of a setter who flushes birds for the hunter, even though this latter gesture is an artificial one. The most important class, although the last in order of development, is the imitative type. Thus, to express the idea of weariness, the Neapolitan wipes his forehead with his thumb, to indicate the removal of sweat; or to indicate that one is a flatterer, the gesturer kisses his own finger-tips. Again, in America as well as in Italy, the idea of cutting the throat is expressed by drawing the inner edge of the hand across the throat; and the American Indian indicates that a man is a liar by placing his hand to his lips and distending two fingers, in imitation of the forked tongue of a snake. To show that one is servile, a cringing attitude may be assumed, while shaking the clenched fist in rage is obviously imitative of the blow given in fight. Certain gestures are involuntary in origin, especially the blush.

A sharp distinction must be drawn between natural and artificial gesture language. From the primitive natural gestures there are developed by imitation, teaching, and convention, numerous artificial gestures, which are occasionally of such complexity that their exact origin may be a matter of doubt. As a single instance may be cited the custom of shaking hands to express friendship. This seems to have originally indicated mutual safety, from the fact that the right hands, which alone could hold the sword, were necessarily empty of weapons. Artificial gesture language may be or become altogether conventional or arbitrary in character. Of this type the deaf-mute alphabet is a familiar example. It is obvious, in the light of what has been said, that the gesture language, like oral language, is divisible into dialects. A sign which indicates one thing in a given gesture dialect may indicate a different thing in another dialect, although dialectic differences are very few in comparison with spoken language. The influence of

speech has operated most strongly on gesture language, which is indeed of very limited scope without the aid of speech. Pure gesture language is practically confined to persons or things present before the person using the signs at the instant when he is employing them. Tense and pronoun are unknown, and it seems safe to affirm that gestures correspond not to words, but to sentences in speech. Syntax, therefore, despite the arguments of certain authorities, seems lacking in this form of communication. Gesture language, like primitive interjections, which also are shared by man with other animals, is thus primarily a reflex emotive expression, originally purposeless in character, but gradually developed on account of the necessity of conveying thought, either without or in addition to speech, which is felt by all mankind.

The forms of gesture language which are the most important for the student of language are those employed by deaf mutes, the American Indians, the Neapolitans, and the Cistercian monks, represented in the United States by the Trappist Order, who have taken the vow of perpetual silence. See also EXPRESSION; GESTURE.

Consult: Wundt, *Völkerpsychologie*, I, *Die Sprache* (2 parts, Leipzig, 1900); *Sprachgeschichte und Sprachpsychologie* (Leipzig, 1901); Delbrück, *Grundfragen der Sprachforschung* (Strassburg, 1901); Jorio, *La mimica degli antichi investigata nel gestire Napoletano* (Naples, 1832); Mallery, *Collection of Gesture-Signs and Signals of the North American Indians, with Some Comparisons* (Washington, 1880); Sittl, *Die Gebärden der Griechen und Römer* (Leipzig, 1890).

GETA, jě'tá, SEPTIMIUS (A.D. 180-212). A son of Septimius Severus, and brother and colleague of Caracalla. Upon his father's death he was proclaimed Emperor, with Caracalla, but in the following year was murdered by centurions at the instigation of his brother.

GETÆ, jě'tě (Lat., from Gk. *Γέται*, *Getai*). An ancient warlike people, who figure in the wars of the Greeks and Romans. At the dawn of history they inhabited the country which is now called Bulgaria. Here Darius encountered them in his Scythian expedition. Shortly before the time of Alexander the Great, who warred with them, the bulk of the nation had migrated northward across the Danube. They spread over a wide region, extending from the Black Sea to the plains of Hungary. The Getæ south of the Danube, in Mæsia, were united in a powerful realm in the time of Cæsar, but this State had only an ephemeral duration, the Roman power becoming supreme in these regions. The Getæ, as an independent people, disappear from history about the close of the first century A.D. At the time of the great migration of nations they appear to have been absorbed by the Goths, with whom they came to be erroneously identified. The Getæ are often mentioned in the literature of the Augustan era as savage and unconquerable foes.

GETHESEMANE, gěth-sēm'á-ně (Aramaic, from *gath*, a wine-press + *shemen*, oil). A small farm or estate on the Mount of Olives, about three-quarters of a mile from Jerusalem, and separated from it by the Kedron Valley. Attached to it was a garden, or orchard, a favorite resort of Christ and His disciples (Luke xxii. 39; John xviii. 1, 2), and the scene of the

agony on the night before Christ's passion (Matt. xxvi. 36-47; Mark xiv. 26-42; Luke xxii. 39-46). The spot pointed out to modern travelers as the site of Gethsemane is admitted to be near the real location, although some think it too near Jerusalem to be Gethsemane itself. It is a place about 150 by 140 feet, inclosed by a stone wall, and contains eight very old olive-trees, which are popularly supposed to have existed in the time of Christ, though they cannot be traced farther back than the sixteenth century. Consult: Conder, *Bible Places* (London, 1897); Thomson, *The Land and the Book*, vol. ii. (New York, 1880-81).

GETTY, gět'ti, GEORGE WASHINGTON (1819-1901). An American soldier, born in Georgetown, D. C. Upon graduation at the United States Military Academy in 1840 he was commissioned second lieutenant in the Fourth Artillery. He served on the frontier during the Canadian border troubles, and, with rank of brevet captain, fought in the Mexican War at Churubusco, Molino del Rey, Chapultepec, and the City of Mexico. In the Civil War he served with the Army of the Potomac in the Virginia Peninsular campaign, and from the siege of Petersburg to the Confederate surrender at Appomattox. He fought also in the Richmond campaign of 1864, and rose to the rank of brevet major-general, United States Army. In 1866 he became colonel of the Thirty-seventh Infantry, in 1882 was transferred to the Fourth Artillery, and in 1883 was placed upon the retired list.

GETTYSBURG, gět'tiz-bürg. A borough and the county-seat of Adams County, Pa., 35 miles southwest of Harrisburg; on the Western Maryland and the Philadelphia and Reading railroads (Map: Pennsylvania, D 4). It is situated among picturesque hills in a fertile agricultural country, and is the seat of a Lutheran theological seminary, founded in 1826, and of Pennsylvania College (Lutheran), organized in 1832. The industrial establishments comprise shirt, furniture, knife, and stocking factories, planing-mills, and a foundry. The borough is governed under a charter of 1853, which provides for a burgess, elected every three years, and a unicameral council. Population, in 1890, 3221; in 1900, 3495. Laid out in 1780, Gettysburg (named after Gen. James Gettys, its founder), was made the county-seat in 1800, and was incorporated as a borough in 1806. One of the most noted battles of the Civil War was fought here, July 1-3, 1863, a Federal army under General Meade defeating the Confederates under General Lee. (See GETTYSBURG, BATTLE OF.) The entire battlefield has been included in a national park, the sites of particular actions being marked by monuments, of which there are now over four hundred. On Cemetery Hill stands the National Cemetery, 17 acres in area, dedicated by President Lincoln on November 19, 1863. In it there are 3629 graves, 1630 of unknown dead. From the brow of the hill rises a battle monument surmounted by a statue of Liberty, and with typical basal figures of War, Peace, History, and Plenty.

GETTYSBURG, BATTLE OF. The most important and most hotly contested battle of the Civil War in America, fought July 1-3, 1863, at Gettysburg, Pa., between the Federal Army of the Potomac, numbering about 82,000 men, under General Meade, and the Confederate Army of

Northern Virginia, numbering about 73,000 men, under General Lee. After the battle of Chancellorsville (May 2-4) the two armies stood for some weeks facing each other across the Rappahannock at Fredericksburg, Va., General Lee taking advantage of the interval to reorganize his army and divide it into three corps, each of three divisions, which he placed under Longstreet, Ewell, and A. P. Hill respectively. This accomplished, and his army being sufficiently rested, he decided upon the invasion of Pennsylvania, hoping by this bold plan to draw Hooker, then commanding the Army of the Potomac, in pursuit, to defeat the Federal Army on Northern soil, to threaten and perhaps capture Washington, to secure the support or at least recognition of France and England, and to bring the war to a close, forcing from the North a recognition of the independence of the Confederacy. On June 3d he began to move, and by June 26th each of the three corps had crossed the Potomac into western Maryland, Ewell having passed over about ten days earlier and having entered Pennsylvania, where he threatened Harrisburg. Hooker followed along the east bank of the Rappahannock about the middle of June, and on the 25th and 26th crossed the Potomac at Edwards Ferry. On the 28th he was superseded as commander of the Army of the Potomac by General Meade, who soon selected a field of battle along Pipe Creek, on which, if possible, to concentrate his forces and meet the Confederate Army. On the afternoon of June 30th, however, Buford, with a force of Federal cavalry, occupied McPherson's Ridge, beyond Seminary Ridge, west of Gettysburg, and here, at about eight o'clock on the following morning, he came in contact with Heth's division of Hill's Confederate corps, the whole Confederate Army having been ordered by General Lee to concentrate at Gettysburg. Though considerably outnumbered, he stubbornly held his ground for two hours, until the arrival of General Reynolds at the head of the First Corps of the Federal Army, which was reinforced about 1 p.m. by the Eleventh Corps under General Howard, the Federal troops now occupying ground north as well as west of Gettysburg. At about one o'clock, also, General Ewell arrived with a part of his corps, the rest coming up during the afternoon, and took command on the Confederate side. At about 4 p.m. the Confederates advanced for what proved to be their final attack, drove the Federals from the field, and occupied the ground thus vacated. The Federals, under Hancock, who had superseded Howard by Meade's orders about 3.30 p.m., took up a strong position on Cemetery Ridge and Culp's Hill (south and southeast of Gettysburg), which they quickly fortified. Both sides had suffered heavily during the day in killed and wounded, and the Confederates took several thousand prisoners. The Federals sustained their severest loss in the death of General Reynolds, who was killed instantly by a Confederate sharpshooter late in the morning. Thereafter until the arrival of General Howard, General Doubleday had been in command. During the night and the following day almost the whole of each army was brought upon the field, though Pickett's division of Longstreet's corps did not arrive until toward night on the 2d. The Federal position formed a long convex line, beginning at Culp's Hill and ending at Round Top, General Sickles, with the Third Corps, occupying ground

somewhat in advance and to the north of Little Round Top, his line following roughly the angle formed by the junction of the Emmitsburg Road and the crossroad leading therefrom to the Taneytown Road, east of the Federal position, and being 'refused' toward Devil's Den. At the crossing there was a peach orchard, and between the crossing and the ridge along which the Federals were intrenched there was a wood north of the road and a wheat-field south of it. The Confederate position, on the other hand, formed a much longer and thinner concave line, with Longstreet in command on the right, A. P. Hill in the centre, and Ewell on the left. Lee, against the emphatic advice of Longstreet, who wished to manœuvre the Federals out of their position and interpose the Confederate Army between Meade and Washington, resolved to attack, and issued orders, accordingly, to Longstreet on the right and Ewell on the left, the former being expected to make the principal assault. The operations on the right did not begin until about 4 p.m. on July 2d, though, according to many Southern writers, Longstreet should have delivered his attack early in the morning, when there would have been a much greater chance of Confederate success. When made, however, the attack was vigorous and spirited, and, after a fierce conflict, the angle at the peach orchard was broken in, and the Federals were forced to abandon their advanced position and fall back upon their main line, along Cemetery Ridge. The Confederates, however, were unable to carry Round Top and Little Round Top, the points of greatest strategic value on the Federal left. During the engagement Sickles was wounded and General Meade added the Third Corps to the command of General Hancock. In the defense of Little Round Top, which Warren had caused to be occupied in time to repel the Confederate attack, two able Federal generals, Weed and Hazlett, were killed, and another, Vincent, was mortally wounded. On each side the losses were exceedingly heavy. Late in the afternoon, after an artillery duel lasting about an hour, Early and Johnson, both of Ewell's corps, led their divisions against the Federal right, Early assaulting Cemetery Hill and Johnson Culp's Hill. Early, with whom Rodes, commanding the other division of Ewell's corps, failed properly to cooperate, attacked with great vigor, and succeeded in breaking a line of infantry on the slopes and overrunning Wiedrich's Eleventh Corps and Rickett's reserve batteries; but was finally driven back, the Federals at this point thus preserving the integrity of their line. Meanwhile Johnson had met with more success at Culp's Hill, whose defenders had been greatly reduced in number in order to reinforce Sickles on the Federal left, and gained a substantial foothold, which he held over night, but from which he was driven before noon on the following day.

On the night of the 2d Meade held a council of war, in which it was decided to hold the Federal Army in the position then occupied and await further attack. On the morning of the 3d Lee ordered Longstreet to send Pickett forward to assault the Federal centre as soon as the Confederate artillery should have silenced or noticeably weakened the artillery on the other side. At 1 p.m. began a terrific artillery duel, the Confederates concentrating most of their fire from about one hundred and fifty guns on Ceme-

tery Ridge, and the Federals answering with about seventy guns, under the direction of Gen. Henry J. Hunt, chief of artillery in the Army of the Potomac. After about an hour and a half, the Federal artillery, though not seriously damaged, ceased firing to save ammunition and prepare for the Confederate attack. This silence being misconstrued by the Confederate officers, Pickett's division, numbering altogether about 5000, moved forward, supported on the right by Wilcox, with about 5000 men, and on the left by Pettigrew, also with about 5000, to attack the Federal centre on Cemetery Ridge, under the immediate command of General Hancock. The charge was one of the most magnificent known in military history. Advancing steadily in three columns, in face of a destructive artillery fire, the Confederates promptly filled up the great gaps cut into their lines by the Federal shells, and encountered unflinchingly, after they had passed beyond the Emmitsburg Road, a terrific fire of canister and an enfilading cannonade from a battery on Little Round Top. When within about three hundred yards of the Federal line they met the musketry fire of the Federal infantry, which had been previously withheld. Pettigrew's advance was utterly demoralized, while Wilcox dropped behind, veering, somewhat bewildered, to the right. Pickett's men, nevertheless, pressed on, and in a hand-to-hand conflict carried the first Federal line, but were soon driven back, and were finally forced in rapid retreat, their ranks being enveloped by pursuing Federals, back to the Confederate lines. As many as two-thirds of Pickett's immediate command, according to some writers, were killed, wounded, or captured. Of his three brigade commanders, Garnett was instantly killed; Armistead, who had penetrated farthest, was mortally wounded; and Kemper was severely injured. On the Federal side, General Hancock was badly wounded and many able officers were killed. Meanwhile, on the Federal right, Gregg defeated the Confederate General Stuart in a spirited cavalry engagement, and on the Federal left, General Farnsworth was killed, while making a cavalry charge, under General Kilpatrick's orders, against Longstreet's advanced skirmishers. Both armies rested during the 4th, but on the ensuing night, under cover of the darkness and a heavy rain, Lee began his retreat toward the Potomac, which he crossed on the night of the 13th, without having been attacked by the pursuing Federal Army. During the three days' battle the Federal Army lost 3072 killed, 14,497 wounded, and 5434 captured or missing; the Confederate Army, according to official reports, which, however, have been called in question, 2592 killed, 12,709 wounded, and 5150 captured or missing. The battle has been regarded as the turning-point of the Civil War.

Consult: Official Records, vol. xxvii., Parts I., II., and III.; Johnson and Buel (editors), *Battles and Leaders of the Civil War*, vol. iii. (New York, 1887); Doubleday, *Chancellorsville and Gettysburg* (New York, 1882); Comte de Paris, *Battle of Gettysburg* (Philadelphia, c.1886); id., *History of the Civil War in America*, vol. iii. (English translation, Philadelphia, 1875-88); Drake, *Battle of Gettysburg* (Boston, 1891), a popular account; Longstreet, *From Manassas to Appomattox* (Philadelphia, 1896); Swinton, *Twelve Decisive Battles of the War*

(New York, c.1867); Pennypacker, *General Meade* (New York, 1901); Bache, *Life of General George Gordon Meade* (Philadelphia, 1897); Long, *Memoirs of Robert E. Lee: His Military and Personal History* (New York, 1886); White, *Robert E. Lee and the Southern Confederacy* (New York, 1897); Walker, *General Hancock* (New York, 1894); Nicolay and Hay, *Abraham Lincoln: A History*, vol. vii. (New York, 1890); and Goodnow, "The Battle of Gettysburg," in the *Annual Report of the American Historical Association for 1895* (Washington, 1896).

GEULINCKX, hē'lings, *Fr. pron.* zhē'lānks', **ARNOLD** (1625-69). A Dutch philosopher. He was born at Antwerp, studied theology and philosophy at Louvain, and afterwards remained twelve years as a successful lecturer and teacher of the classics and the Cartesian philosophy. For some reason not certainly known, but supposed to have had connection with his intended marriage, and his attacks upon scholasticism, he was compelled in 1658 to leave Louvain and went to Leyden, where he became a Protestant, was married, endured many hardships due to poverty, and in 1665 was helped by an influential friend to the position of extraordinary professor in the university. Entering into this work with great zeal, he continued in it until his death. He was distinguished among the followers of Descartes, and his writings contain germs of thought that were afterwards developed by Spinoza and Malebranche. He gave special attention to the doctrine of the relation between the soul and the body. Descartes had already so separated extension and thought that only in the teeth of logic could he maintain against Gassendi the possibility of any interaction between them. Geulinx was more consistent. Accepting from Descartes this separation, he maintained that interaction was impossible, for one cannot be the author of any state of which one is unconscious: for man's very nature is consciousness; but a man is not conscious of the mechanism by which bodily motion is produced, hence he is not the author of bodily motion. Body and mind are like two clocks which act together, because at each instant they are adjusted by God. A physical occurrence is but the occasion on which God excites in the soul a corresponding mental state. Geulinx thus originated the theory of occasional causes. (See OCCASIONALISM.) But this theory compelled a further advance. God, who is the cause of the union of body and mind, is the sole cause in the universe. No fact contains in itself the ground of any other. The existence of the facts due to God, their sequence, and coexistence are also due to Him. He is the ground of all that is. Apart from God the finite being has no reality. In this Geulinx led the way for Spinoza. This occasionalistic view, carried out consistently, of course leads to the doctrine that we cannot know extended reality directly, but have merely an idea of it, occasioned in us by God. Geulinx's main works were: *De Virtute et Primis ejus Proprietatibus* (1665; ten years later a new and enlarged edition appeared under the title *Tractatus de Virtute*); *Logica* (1662); *Methodus Inveniendi Argumenta* (1663); *Metaphysica Vera et ad Mentem Peripateticam* (1691). A complete edition of his works in three volumes has recently been published by Land (The Hague, 1891-93). Consult: Grimm, *Arnold Geulinx' Erkenntnistheorie und Occasionalismus* (Jena,

1875); Land, *Arnold Geulincx und seine Philosophie* (The Hague, 1895); Pfeleiderer, *Arnold Geulincx als Hauptvertreter der occasionalistischen Metaphysik und Ethik* (Tübingen, 1882); Van de Haeghen, *Geulincx: Etude sur sa vie, sa philosophie et ses ouvrages* (Ghent, 1886).

GE'UM (Lat., herb-bennet, avens). A genus of plants of the order Rosaceae. It is nearly allied to *Potentilla*, but is distinguished by the hardened, hooked eyes which crown the carpels, and which are dry and become a bur. Two species are common natives of Great Britain, common avens or herb-bennet (*Geum urbanum*), an herb about one to two feet high, and water-avens (*Geum rivale*), about one foot high. Both of these species have the radical leaves interruptedly pinnate and lyrate, and the cauline leaves ternate, but *Geum urbanum* has erect yellow flowers, and *Geum rivale* has nodding flowers of a brownish hue. The former grows in hedges and thickets, the latter in wet meadows and woods, and sometimes even in alpine situations. Both are aromatic, tonic, and astringent, and are employed to restrain mucous discharges, and in cases of dysentery and intermittent fever. The root of *Geum rivale* is used also in diseases of the bladder. The root of *Geum urbanum* has when fresh a clove-like taste, and is used to flavor ale; for this purpose it is gathered in spring before the stem grows up. *Geum rivale* is a common plant in the United States as far west as Missouri. The chocolate-root (*Geum strictum*) of North America has some reputation as a mild tonic. It was once employed in the United States in diseases of the bladder. It much resembles the British species in its leaves and has erect flowers like those of *Geum urbanum*. Many of the species are very hardy, and are used in borders and other ornamental plantings. One group has plumose styles that are very attractive after the petals have fallen. *Geum Chilense*, a native of Chile, is one of the best of this class. Other species are particularly adapted to rockeries. The genus is mainly represented in the cooler regions of the two hemispheres.

GEVAERT, *ge-värt'*, FRANÇOIS AUGUSTE (1828—). A Belgian composer and writer on music, born at Huyse. When thirteen years old he was sent to the Ghent Conservatory, and soon after became organist of the Jesuits' Church at Ghent. In 1847 he won first prize for composition at the Brussels National Competition, and two years later visited France, Spain, and Italy, a trip made possible for him by his success in the above competition. In 1852 he returned to Ghent, where he lived for a number of years as a composer. In 1867 he was appointed 'chef de chant' at the Académie de Musique, Paris; in 1871, succeeded Fétis as director of the Brussels Conservatory; and in 1873 was elected a member of the Académie des Beaux-Arts. He composed a number of successful operas, among them *Le capitaine Henriot* (1864), *Le diable au moulin* (1859), and *La comédie à la ville* (1848), as well as cantatas and songs, but is best known for his works on music. *Traité d'instrumentation* (1863; German trans. by Riemann, 1887) is a standard work, and one of the few thorough treatises on that subject. His other writings include: *Les origines du chant liturgique de l'église latine* (1890, German trans. by Riemann); *Les*

gloires de l'Italie (1868); and *Chansons du XVème siècle* (1875).

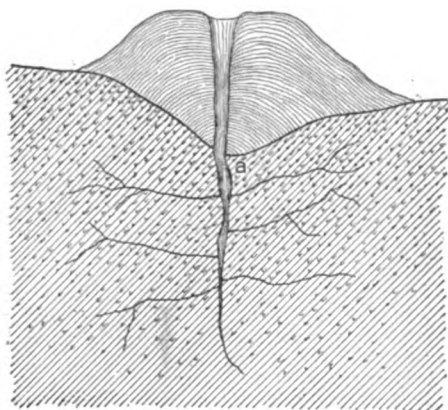
GEVELSBERG, *gä'vels-bèrk*. A town in the Prussian Province of Westphalia, 28 miles east by north of Düsseldorf (Map: Germany, B 3). Its manufactures include iron and steel wares, hearths, gas stoves, and machinery. Population, in 1890, 9379; in 1900, 13,499.

GEWANDHAUS-CONCERTE, *ge-vánt'hous kón-tsér'te*. The name of a famous concert institute in Leipzig. The word *Gewandhaus* signifies a cloth merchants' hall, and these concerts were so called because, for want of a suitable hall, they were held in such a building. Their beginning dates back to 1743, when Doles began a series of subscription concerts which he continued until 1756, when they were interrupted by the Seven Years' War. J. A. Hiller revived the concerts in 1763 under the name of *Liebhaber-konzerte*. The orchestra, which originally consisted of but sixteen performers, was increased to thirty. In 1781 the burgomaster Karl Müller, together with eleven others, organized a board of directors, and opened subscriptions for a series of twenty-four concerts to be given every season. At present the orchestra consists of about seventy performers, and twenty regular subscription concerts are given. Besides these, two benefit concerts are arranged annually—one for the orchestra pension fund, the other for the poor. When, in 1835, Mendelssohn assumed the conductorship of the Gewandhaus concerts, they soon rose to such fame and importance that for a time Leipzig was the centre of music not only of Germany, but of all Europe. Among the eminent conductors have been Doles, J. A. Hiller, Mendelssohn, F. Hiller, Gade, Rietz, Reinecke, Nikisch.

GEYSER, *gi'zër* (Icel. *Geysir*, name of a famous hot spring in Iceland, from *geysa*, *gjösa*, to gush). An eruptive thermal spring. A true geyser has an underground passage communicating with a source of water-supply and usually terminating at the surface in a basin built up by a deposition of sinter. From the surface vent eruptions of hot water accompanied by subterranean rumblings take place at more or less regular intervals. In the powerful outbursts the water is shot upward with a loud roar to a height of 100 feet or more; this display continues for a brief time, and then subsides until the next period of activity. The occurrence of geysers is limited to regions of recent volcanic activity, where hot springs and mud springs are accompanying phenomena. The geysers of Iceland have been known for many centuries, while those of Yellowstone Park and of North Island, New Zealand, were discovered only in the last century. The most prominent examples in Iceland are the Great Geyser, the Little Geyser, and the Stokkr; the first has a pipe nearly ten feet in diameter, and erupts at intervals of a day or more, hurling the water like an immense fountain to a height exceeding 100 feet. In Yellowstone Park there are at least 70 eruptive geysers, and nearly 3000 vents of mud volcanoes, fumaroles, and hot springs, most of which occur in four basins. The surface is covered with terraces and elevations surrounding the openings, beautifully ornamented with snowy deposits of silica. Among the most remarkable of these geysers are the Giant, which

throws a column of water five feet in diameter to a height of 200 feet, playing continuously for an hour and a half; Old Faithful, which spouts with great regularity every sixty-five minutes, sending the water to a height of 125 feet; Castle Geyser, issuing from a chimney twelve feet high; Excelsior, which has a basin 200 feet in diameter, and spouts at intervals of eight years; the Giantess, which is said to throw a column twenty feet in diameter; the Beehive; and the Grand Geyser. The terraces of Rotomahana, New Zealand, once rivaling those of Yellowstone Park, were destroyed by a volcanic eruption in 1886.

The investigations of Bunsen in the geyser region of Iceland, confirmed as they were by laboratory experiment, have been generally accepted by geologists as affording a satisfactory



SECTION OF GEYSER.

explanation of the origin and activity of eruptive thermal springs. By seepage from the surface the geyser tube (a) is filled with a column of water, which, at a considerable depth, receives heat from buried lava flows or other volcanic sources. When the temperature in the lower part of the tube is raised to such a point that the water boils in spite of the superincumbent column, a portion of the water is changed into steam, and by expansion causes an overflow at the surface. Thus relieved of pressure, a large quantity of water flashes into steam, and ejects the whole column violently into the air. If the circulation of the waters be impeded by throwing stones into the geyser tube, the eruption can often be hastened. Geysers in many cases were originally hot springs, from which they have gradually developed by building and extending their tubes. Hot alkaline springs carry silica in solution, which is readily precipitated along the path of the flowing water; as the tube becomes longer, the difference in temperature between the upper and lower portions increases, until sufficient to cause an eruption. In course of time geysers must lose their activity, and again become hot springs, or the flow of water may be entirely checked by structural changes in the tubes. Consult: *United States Geological Survey of the Territories*, 5th and 6th Annual Reports (Washington, 1872-73); Bunsen, *On the Intimate Connection Existing Between the Pseudo-Volcanic Phenomena of Iceland* (London, 1848); Malfroy, *On Geyser Action at Rotorua* (1891).

GEYSERITE, g'zër-it. A name given to a variety of opal that occurs in concretionary deposits around the geysers of Iceland, New Zealand, and in the Yellowstone Park. It frequently occurs in white or grayish porous stalactitic or filamentous forms that are sometimes of great beauty. Varieties that are compact-massive or scaly-massive in appearance are sometimes found. The mineral consists essentially of silica, with from 9 to 13 per cent. of water.

GEYTER, g'ètër, JAN DE (1830—). A Flemish poet, born at Lede. His works are distinguished by a largeness of vision, and vigorous, expressive language. They include: *Drie menschen van de wieg tot in het graf. Een epos uit onzen tijd* (1861); *Geuzenlied* (1872); *Reinaart de vos*, a charming version of the old poem (1874); *Vlaanderens kunstroom* (1872); *De Wereld in. Schoolcantate* (1880); *De Rijn* (1882); and *Keizer Karel in het rijk der Nederlanden* (1888), an epic.

GFRÖRER, g'frërër, AUGUST FRIEDRICH (1803-61). A German historian. He was born at Calw in the Black Forest, and much against his own inclination was put to studying theology, and kept at it till the age of twenty-two. After traveling in Switzerland and Italy, he became tutor in theology at Tübingen in 1828, and in 1830 secured a position in the National Library at Stuttgart. His ability was very great, and his energy inexhaustible, and the works he now put forth received, and deserved, great attention. His whole life manifested a steady evolution from liberal Protestantism to Ultramontane Catholicism. During the writing of his *Philo und die jüdisch-alexandrinische Theosophie* (1831), and the *Geschichte des Urochristentums* (1838), his views on Christianity underwent a radical transformation. During the publication of *Gustav Adolf und seine Zeit*, he changed his point of view, and while at work on his *Allgemeine Kirchengeschichte* (1841-46), embracing the history of the Christian Church to 1305, he became convinced of the wrongfulness of the Reformation and the truth of the Catholic position. He was called to the Catholic University of Freiburg in 1846, showed himself an enemy of Prussia at the Frankfort Parliament, 1848-49, and became a vigorous champion of the Catholic faith, which he embraced in 1853. He died July 6, 1861. Besides the works already mentioned, he wrote: *Urgeschichte des menschlichen Geschlechts* (1855); *Papst Gregor VII. und sein Zeitalter* (1859-61); *Geschichte des 18. Jahrhunderts* (1862-74); *Zur Geschichte deutscher Volksrechte* (1866); *Byzantinische Geschichten* (1872-74). The last three works were published by Weiss after the death of the author.

GHADAMES. See GADAMES.

GHARA, g'rà'a. The name borne by the Sutlej, the easternmost of the five rivers of the Punjab, below its confluence with the Beas (Map: India, B 2). The Ghara unites with the Chenab, which has previously collected the waters of the Jhelum and the Ravi, to form the Panjnad, which carries the drainage of the Punjab into the Indus. See SUTLEJ.

GHARDAYA, g'är-di'a. See GARDAIA.

GHARIAL, or **GHARIYAL**. See GAVIAL.

GHATS, g'ats. The name (see GHATS below) applied to two converging ranges of mountains,



GEYSERS
CASTLE GEYSER AND CRYSTAL SPRING (UPPER)
NORRIS GEYSER BASIN (LOWER)

or scarpments, which run parallel with the east and west coasts of the peninsula of India, hence known as the *Eastern* and *Western Ghats*. The Eastern Ghats extend, with an average height of 1500 feet from the vicinity of Orissa to Coimbatore, along the eastern side of the Indian Peninsula, a distance of from 50 to 150 miles from the Bay of Bengal (Map: India, C 6). Before joining the kindred ridge at this last-mentioned point, they send forth, about 36 miles to the north of Madras, a spur common, as it were, to both ranges, and reaching the other range to the north of the gap of Palghatcheri. To the south of the departure of this connecting chain, the Eastern Ghats become less continuous and distinct.

The Western Ghats stretch from the south side of the Tapi to their junction with the kindred ridge, at a distance of 20 miles from Cape Comorin, or, in fact, to Cape Comorin itself (Map: India, B 5). Though they are generally far more continuous and distinct than the Eastern Ghats, yet they are sharply divided by the gap of Palghatcheri, 16 miles wide, the northern section measuring 800 miles in length, and the southern 200. Their general elevation appears to vary from about 3000 feet to fully 7000 feet. The peak of Dodabetta, in that portion of the Western Ghats known as the Nilgiris, is 8760 feet above the level of the sea. The opposite faces of these mountains differ remarkably from each other. Landward, there is a gradual slope to the tableland of the Deccan; seaward, almost perpendicular precipices, to speak generally, sink at once nearly to the level of the sea, at a distance ranging from 40 to 70 miles, but at one place approaching within six miles. From this peculiarity, aggravated by the heavy rains which the southwest monsoon dashes against the lofty barrier before it, the maritime strip, more particularly toward the south, presents that singular feature of stagnant shallow lakes known as the 'Backwaters.' See COCHIN.

GHATS (Hind. *ghāt*, step, Skt. *ghatta*, quay, from *ghatt*, to touch; connected with *gharsh*, to rub), or, as usually written, **GHAUTS**. Structures along the banks of rivers, erected to afford easy access to bathers. They are peculiar to Northern Hindustan, and line the river banks in most of the great cities, more especially those situated on the Ganges. A ghat consists, in general, of a long, high building, fronting the river, to which access is had by means of several flights of steps, connected with a broad quay, forming the essential part of the structure, as the wall or building is only for the protection of loungers from the sun's rays. The uniformity of the long lines of steps is broken by small projections, often crowned by kiosks, which relieve the eye. Though the Ganges, being the sacred river, is *par excellence* the river of ghats, one of the most beautiful in Hindustan is that at Maheswar, on the Nerbudda; and though Benares prides itself upon possessing the greatest number of ghats, it is almost rivaled by Ujjain and other cities. Consult Fergusson, *History of Indian and Eastern Architecture* (London, 1876).

GHAZAL', or **GHAZEL'** (Ar., love-poem, from *ghazila*, to be affectionate). An Oriental ode. It was a favorite form of lyrical compo-

sition among the Persians, and corresponds in some respects to our idea of the sonnet. The ghazal consists of from five to sixteen or seventeen couplets written in the same metre and according to fixed rules of rhyme. The opening couplet has its two lines rhyming with each other, and this rhyme is repeated in the second line of each succeeding couplet, which gives to the ghazal a uniformity that approaches monotony, according to Western, but not Eastern, standards of taste. In the last two lines, or couplet royal, called *makṭa* or *khātimah*, 'close,' the poet introduces his own name as a signature or envoy. Certain departures from these formal rules are found. As to subject, the burden of the ghazal is generally the praise of the poet's sweetheart, or his despair at her indifference; the beauty of the spring, the blush of the rose, the song of the nightingale, or the joys of wine and conviviality. Among the Persian poets, Hafiz (q.v.) is the most famous writer of ghazals, and a number of these have, so far as the form is concerned, been successfully rendered into English. Mention, for example, may be made of "Versions of Hafiz," by Walter Leaf (London, 1898). The German poets Platen, Rückert, and Bodenstedt have very skillfully adapted this form of composition in their 'Ghaselen.' On the latter, consult Remy, *Influence of India and Persia on German Poetry* (New York, 1901).

GHAZALI, *gā-zh'āl*, ABU HAMID MOHAMMED IBN MOHAMMED AL. A celebrated Arabian philosopher, born at Tus in Khorassan. He began his studies in his native town, and continued them at Nishapur. In 1091 he went to Bagdad, at that time a seat of Arabic learning, and became a teacher. His religious views, however, underwent a change, and in consequence he resigned his position after four years. He then made the pilgrimage to Mecca, traveled to Damascus and Jerusalem, and gradually came to adopt an ascetic life. In 1106 he returned to Tus, leaving it again at the solicitation of Mohammed ibn Malik Shah, to teach at Nishapur. He soon came back to Tus, and established a monastery for Sufites and a school for theological studies. Ghazali began with the Aristotelian system, but later turned against it in his *Tahafut al-Falasifa* (Destruction of Philosophers), a work which was answered by Averroës. His most important work was the *Ikhya ulum ad-din* (Restoration of Religious Sciences), in which he seeks to remove the dead formalism that had grown up in Islam, and to spiritualize it instead. An ethical work of Ghazali, *Ayyuha l-walad* (O Child), has been translated into German by Hammer-Purgstall (1838). Among his other works may be mentioned *Al-munkidh min ad-dalal*, an account of his philosophy, translated into French by Barbier de Meynard in *Journal Asiatique* (Paris, 1877); *Makasid al-falasifa* (Tendencies of the Philosophers), of which two chapters were published by Beer (Leyden, 1888); *Mizan al-amal*, a work on morals, a Hebrew translation of which was published by Goldenthal (1839); and *Ad-durrah al-fahira* (The Costly Pearl), a work on Mohammedan eschatology (text and French translation by Gautier, Paris, 1878). Ghazali's unpublished works are numerous, and treat of such varied subjects as theology, ethics, jurisprudence, philosophy, and

poetry. Consult Gosche, *Ueber Ghazzali's Leben und Werke* (Berlin, 1859).

GHAZAN KHAN, gâ-zân' kân. See MONGOL DYNASTIES.

GHAZI (gâ'zê) **MOHAMMED**. See SHAMYL.

GHAZIPUR, gâ'zê-pôor'. The capital of a district of the same name in the Northwest Provinces, British India. It extends for two miles along the left bank of the Ganges, in latitude 25° 32' N. and longitude 83° 39' E., 44 miles northeast of Benares (Map: India, D 3). The climate is hot and humid. Large quantities of roses are grown in the vicinity for the manufacture of rose-water and attar of roses. Ghazipur is the Government opium depot for the Northwest Provinces. Its chief objects of interest are the remains of the Chalestoon or Palace of Forty Pillars, used as the custom house, and a fine marble statue of Lord Cornwallis, who died here in 1805. Population, in 1891, 44,970; in 1901, 39,186.

GHAZNI, gâ'z'nê, or **GHEIZNI**, gî'z'nê. A city in the southeastern part of Afghanistan, over 80 miles southeast of Kabul, situated on the river Ghazni at an altitude of nearly 8000 feet (Map: Afghanistan, L 4). It is surrounded by a mud wall and derives considerable commercial importance from its position on the caravan route between Persia and India. Population, estimated at 10,000. A short distance from Ghazni are the ruins of Old Ghazni, once one of the finest cities of Asia, and capital of the Ghaznivides (q.v.). Ghazni was taken by the English under Lord Keane in 1839, and under General Nott in 1842.

GHAZNIVIDES, gâ'z'ni-vidz. A celebrated Mohammedan dynasty of 21 rulers, named from their seat in Ghazni, a city of Afghanistan. In the height of its power it possessed an empire extending from the Tigris to the Ganges, and from the Sihon or Sir-Darya to the Indian Ocean. The founder of the line was ALP-TIGIN, a freedman of Nasr I. of the Samani dynasty, who ruled over Ferghana, Kashgar, and Turkestan. Alp-Tigin, born in 880, was appointed Governor of Khorassan. In 961 he took possession of Ghazni and for fifteen years successfully withstood the Samani (q.v.). On his death, in 977, his slave SABUK-TIGIN was unanimously chosen as his successor. He was distinguished for prudence and valor as well as for humanity and justice. By him the kingdom was extended from the Indus to Khorassan and from the Gulf of Oman to the Sir-Darya or Jihon. Sabuk-Tigin died in 997, and was succeeded by his younger son ISMAIL. The elder son, MAHMUD YAMIN UD-DAULAH, the most famous of the dynasty, who had been appointed Governor of Nishapur in 994, hearing of his father's death, hastened to Ghazni. He deposed Ismail and assumed the reins of government in 999, with the title of Sultan. In the year following he took complete possession of Khorassan, and in 1001 commenced a series of twelve destructive inroads into Hindustan. On the 8th of Muharram (27th of November) he defeated Jaipal, King of Kabul and Lahore, near Peshawar, with immense slaughter. In 1006, while on his second expedition to India, he was recalled by the news that I-lak Khan of Kashghar, who in 999 had conquered the Samani, was

ravaging Transoxania. In 1007 and 1009 Mahmud made his third and fourth expeditions into Hindustan, and each time carried off an immense booty in money, jewels, and slaves. Returning to Ghazni, he made a liberal distribution from his treasures among the poor and the ministers of religion. Within the next few years he reduced Ghur, Jurjistan, and Khwarezm. In 1025 he was engaged in his last expedition against the Hindus, the famous expedition to Somnath in Southern Gujarat, where he obtained an enormous booty. In 1029 he conquered Irak, but on April 30th of the following year he died at Ghazni, aged sixty-three years. At this time the Empire of Ghazni was at the summit of its glory. Mahmud of Ghazni was a great conqueror and a patron of learning, but his cruelty and greed are dark blots on the short-lived empire which he founded as the first foreign dominion over India. He was succeeded by a younger son, MOHAMMED, who in October of the same year was compelled to resign the sovereignty to his younger brother, MASUD I. This prince was in 1037 signally defeated by the Seljuks (q.v.), who had taken possession of Khorassan. Though an able and warlike prince, misfortunes crowded thickly around his declining years. He was deposed in 1041, and murdered in the following year. During his reign the Seljuks took possession of Balkh, Khorassan, Khwarezm, Herat, and Irak. The sovereigns who in succession reigned in Ghazni were MAUDUD (1042-48); MASUD II. (1048); BAHADUD-DIN ALI (1048); ABD UR-RASHID (1048-53); TUGHRIL (1053); and FARRUKH-ZAD (1053-59). In their reigns there is little besides internecine quarrels at Ghazni, and the encroachments of the Seljuks on the west and north. The reign of Farrukh-zad, however, shed a bright lustre over the expiring glory of Ghazni, for the Seljuk Prince Daud, who thought to take advantage of the dissensions at Ghazni, and marched against it, was signally defeated by Nush-Tigin, the general of Farrukh-zad. Encouraged by this victory, the Ghaznvide forces marched into Khorassan and regained that province. On news of this second defeat, Alp-Arslan (q.v.) was sent by his uncle Tughril Beg (Togrul Bey) to stop the progress of the Ghaznivides. In the battle which ensued, fortune changed sides, and Nush-Tigin was totally defeated. A treaty of peace was then concluded. Farrukh-zad was succeeded by IBRAHIM (1059-99); MASUD III. (1099-1114); SHIRZAD (1114-15); ARSLAN (1115-17); and BAHRAM (1117-50). During the reign of this last prince, the Ghuri, a tribe inhabiting the mountainous country of Ghur in Afghanistan between Ghazni and Herat, began to make inroads upon the territory of Ghazni, and growing bolder by success, attacked and took the capital itself, driving Bahram across the Indus. But on the retreat of part of the Ghuri to their own country, Bahram retook his capital, and put to death the Ghuri prince, Saif ud-Din Suri. Learning this, the brother of the prince, Ala ud-Din Husain, hastened from Ghur, and having defeated Bahram, gave up Ghazni to be pillaged by his followers. Bahram was thus driven a second time across the Indus in 1149 and died in the following year. His son KHUSRU SHAH (1150-60) succeeded him, and took up his residence in Lahore. The many attempts which he made to repossess himself of Ghazni and the surrounding territory were unsuccessful. KHUSRU MALIK

(1160-86), the twenty-first and last monarch of the dynasty, occupied himself in the first part of his reign (1160-66) in extending and consolidating his Indian possessions, but subsequently his whole energies were required to repel the attacks of Shihab ud-Din Mohammed, Prince of Ghur, who, having conquered all the territory west of the Indus, now sought to drive the race of Sabuk-Tigin from their last possession. In 1184 Lahore was all that remained to Khusrū Malik, and the taking of that city by the Ghur Prince in 1186 put an end to the power of the Ghaznivides.

GHEBERS, gēbērs or gābērs, GABERS, GUEBERS, GHIAVERS (Turk. *Ghiaur*, or *Ghaur*). The adherents in Persia of the ancient religion founded or reformed by Zoroaster. As worshippers of Ormazd in Iran they correspond to the Parsis or Zoroastrian exiles in India. This small band, eight or ten thousand in number, stands with the Parsis to-day as the sole representatives of the faith of the Prophet of ancient Iran.

The name Gäber, Gēber, Ghēber, or Gueber, as infidel, is familiarly applied to the fire-worshippers in Persia; for example, in Moore's *Lalla Rookh* and in Byron's "Giaour." The origin of the name is open to discussion. It is commonly explained as a derivative from the Arabic *Kafir*, which is applied as unbeliever to all non-Mohammedans, and is supposed to have been given first to the Persian Zoroastrians by their Arab conquerors in the seventh century A.D. This explanation is doubtful on phonetic grounds. A second suggestion seeks to trace in *gaber* a tribal name or designation as implied in the name *Khabar* of the Talmud (Jebam. 63b., Gitt. 17a, etc.), and in Origen, *Contra Celsum*, 6291, who mentions Kabirs or Persians, and declares that Christianity has borrowed nothing from them. If a guess might be hazarded, one might be tempted to connect the word with the Pahlavi or Middle Persian *gabrā*, found also in Chaldean, in the sense of 'man,' which is applied to the Zoroastrians in the form *Mōg-gabrā*, or Magian man; and then assume a generalization in the sense of 'people, gentiles,' with the derogatory significance of unbeliever, infidel, pagan, heathen, as in the Gentiles of the Bible. Another name applied by the Mohammedans to this sect is *Atas-parast*, or fire-worshippers; or again *Majās*, from the Magi, their ancient priesthood; or also *Farsi*, i.e. Parsi, from Fars or Pars, the name of the Province of Persia. They designate themselves, however, as *Beh-Dīnān* ('those of the Good Faith').

The vicissitudes and misfortunes of these followers of the ancient Persian creed through history have been many and varied. Passing over the earlier history, to be dealt with in other articles, the battle of Nehavend (c.641 A.D.), and the final conquest of Iran by Islam, wrought a complete change in the religious tenets of Persia. The creed of Ormazd and of Zoroaster sank before the rising crescent of Allah and his Prophet; the Avesta gave place to the Koran; and the teachings of Mohammed were adopted by the Persians generally. Only a few sought freedom to worship Ormazd through flight and exile in India; these formed the later sect of the Parsis (q.v.). The small remnant that chose both to abide by their ancestral faith and to re-

main in their old home met with cruel persecution and oppression. So great, in fact, have been the trials of these devoted Zoroastrians for their faith, that within the last two hundred years they have dwindled down from a hundred thousand to a mere handful of representatives that still preserve the early creed. Through hardships they have been reduced largely to poverty and ignorance; but, thanks to the laudable efforts of their well-to-do brethren, the Parsis of Bombay, and the more liberal government of modern Persia, their condition has been greatly ameliorated within the last generation, and still more is being done to restore them to a fitting status of religious freedom in the land that gave them birth. Most of them that exist to-day are to be found in Yazd and Kirman, a few also in Teheran, Ispahan, Shiraz, Urumiah, or about the eternal fire of the naphtha wells of Baku. But, scattered as they are, downtrodden as they have been, they have still kept alive in Iran the spark of their fading worship there, and they still maintain a high reputation for honor, uprightness, morality, and obedience to law that characterizes their more fortunate Parsi brethren in India, and they may rightly claim their title to being men of the 'Good Faith.' See **AVESTA; PARSIS; PERSIA; ZOROASTER.**

GHEE, gē (Hind. *ghī*, from Skt. *ghṛta*, clarified butter, pp. of *ghar*, to drip). A kind of clarified butter used in many parts of India and the East, prepared from the milk of buffaloes or cows. The fresh milk is boiled for an hour or more; it is then allowed to cool, a little curdled milk added, and the curdled mass churned. When the butter begins to become rancid, which is usually the case after a few days, it is boiled till all the water and curd have separated. The fat is then removed, salted, often a little sour milk and some aromatic herbs added, and put into closed pots to be kept for use. It is said to keep for years when carefully prepared. The natives of many parts of India use it extensively, not only as a food, but in medicine and in religious rites. Its strong odor and disagreeable flavor are not attractive to Europeans.

GHEEL, gāl. A well-known Belgian colony for the insane, 26 miles east-southeast of Antwerp. It is a comparatively fertile spot, inhabited and cultivated by 10,000 or 11,000 peasants, in the midst of an extensive sandy waste, called the Campine. The farmhouses, though neat, and generally surrounded by trees and a garden, are evidently in the hands of the poor. They are sometimes built of brick; much more generally they are constructed of wattled or wicker work, thickly laid over with mud or plaster, and whitewashed. The dwellings are arranged into three classes, or cordons: those of the village proper; those scattered around in its immediate vicinity; and those collected into hamlets in the more distant and least reclaimed portions of the commune, which is about 20 miles in circumference.

Historically, Gheel is noticed as having been the spot where a woman of rank, said to have been of British origin, was murdered by her father, in consequence of her resistance to his incestuous passion. Pilgrims, the sick, the sorrowful, and the insane, visited the tomb of the Christian virgin; the last were restored to sanity and serenity. Dymphna became the tutelar saint

of those stricken in spirit; a shrine rose in her honor, which now, for ten centuries, has been consecrated to the relief of mental disease, and has collected around it hundreds of lunatics, chiefly of the poorer classes. Formerly, besides the benefit derivable from proximity to the ashes of the saint, and from the prayers of the Church, the afflicted underwent a sort of novitiate in a building adjoining the church, where they were chained to the wall, and subsequently passed under the mausoleum of their patron, etc.; but now there do not appear to be any other than the ordinary ministrations of the Church to which the patients belong resorted to as treatment.

About 1300 insane persons are lodged with the citizens of this community, or with 1000 heads of families, and are controlled and employed by them. The quiet and industrious reside generally one in each family in the town, the more excited in the suburban cottages, and the most unmanageable with the laborers on the confines of the commune. In the enjoyment of comparative liberty, and of what is called the free-air treatment, these patients are, upon the whole, contented, tranquil, and healthy. Each individual is maintained for about eleven cents to fifteen cents per diem. Until recently, this colony was merely a psychological curiosity; recently the anomaly and absurdity of treating all cases alike, and independently of medical aid, have led to the institution of a medical staff, the erection of a hospital, and the introduction of many salutary alterations in the relations between the insane and their custodians in classification and supervision. The compatibility of the seclusion of the insane with greater freedom, with domestic life, and association with the sane, have suggested the introduction of cottage asylums as a modification in the accommodation of this class in this country. Consult: Duval, *Gheel* (Paris, 1860); Brandes, *Die Irren-colonien* (Hanover, 1865); Rüdy, *Gheel* (Bern, 1874); Pilgrim, "A Visit to Gheel," in *American Journal of Insanity* (Utica, N. Y., 1886).

GHEGA, gǎ'gǎ, KARL VON (1800-60). An Austrian civil engineer, born in Venice. After being engaged in hydraulic engineering and in the construction of mountain roads in Northern Italy and the Tyrol, he spent several years in investigating railroads in the United States, and upon his return was intrusted with several important projects, such as the celebrated Semmeringbahn. He originated several improvements in railroad construction and wrote a number of important works on that subject, among which may be mentioned: *Uebersicht über die Hauptfortschritte des Eisenbahnwesens 1840-50* (3d ed. 1853); and *Ueber nordamerikanischen Brückenbau und Berechnung des Tragungsvermögens der Hoveschen Brücken* (1845).

GHENT, gĕnt (Fr. *Gand*, from OFlem. *Gend*). The capital of the Belgian Province of East Flanders, and one of the most important cities of Belgium, situated at the confluence of the Lys with the Scheldt, 31 miles northwest of Brussels (Map: Belgium, B 3). It is intersected by a number of streams and canals spanned by more than 250 bridges. The older portion with its narrow streets and gabled buildings bears a decidedly Flemish aspect, and possesses numerous buildings of great historical interest: the newer part of the city is well laid out and modern in its

architecture. The city is about eight miles in circumference, and contains extensive gardens and promenades. The chief ecclesiastical building is the Cathedral of Saint Bavon, with its unpretentious Gothic exterior and splendid interior. The crypt dates from 941; the last part of the building was completed only in 1554. Besides the architectural beauty of its interior, and its age, the cathedral is famous for its art treasures, among which is included the famous "Adoration of the Lamb" by the brothers Van Eyck, and one painting by Rubens. Near the cathedral stands the belfry, a square tower 375 feet high surmounted by a gilded dragon and containing a chime of 44 bells. It was begun in 1183. The Church of Saint Nicholas, the oldest in Ghent, was begun in the tenth century, but the larger part was constructed at the beginning of the thirteenth. It is built in the early Gothic style, and has an unfinished tower with ten turrets. The Church of Saint Michael, dating from the fifteenth century, is built in Gothic style, and contains a number of fine pictures, including the "Crucifixion" by Van Dyke.

The secular buildings of Ghent are also of great architectural beauty and historic interest. The town hall, of which the northern façade was constructed in 1518-33, and the eastern façade in 1595-1622, is regarded as one of the finest specimens of Gothic architecture in Belgium. The Palais de Justice, completed in 1846, is also an imposing building with a Corinthian portico, and a bronze statue of Metdepenningen in front. The Institut des Sciences, completed in 1890, is one of the largest public buildings of Ghent, and contains the lecture rooms and laboratories of the university, which was founded in 1816. Ghent has a number of old guild houses, and about twenty monasteries. Among the squares of the town the most noteworthy is the Marché du Vendredi, which has been the scene of the most important events in the history of the city. It has a bronze statue of Jacob van Artevelde in the centre, and a huge cannon, known as the Dulle Griete, in the north-western corner. In the northeastern part of the city is situated the nunnery of Grand Béguinage, founded in the thirteenth century. It is surrounded by walls and moats, and with squares, church, and small houses, presents the appearance of a town in miniature. The old castle or Oudeburg, constructed in the tenth century, was once the residence of the Counts of Flanders, and after a century of service as a factory has come into the possession of the city, which has restored it to its former appearance.

At the head of the educational institutions of Ghent is the university, with its four faculties of philosophy, law, natural sciences, and medicine. It has an attendance of about 750 students; its library contains about 350,000 volumes; and there are collections of coins and copper engravings. The laboratories of the university and the faculty of natural sciences have been transferred to the Institut des Sciences, opened in 1890. Besides the university, Ghent has a gymnasium conducted by the Jesuits, a seminary, an academy of painting, a conservatory of music, and several schools for manual training. There are also two theatres, an art museum, botanical and zoological gardens. Ghent

has greatly decreased in industrial importance since the fifteenth century, when it was one of the chief centres of the textile industries of Europe. It has still a considerable number of linen, woolen, and cotton mills, lace-factories, tanneries, breweries, etc. Among the chief products of Ghent are flowers, which are exported all over Europe. Ghent has good communication facilities, and its commerce is still of considerable magnitude, the exports consisting chiefly of manufactured goods and agricultural products. Ghent is the seat of a court of appeal, a commercial court, and a number of consular representatives. The population was 131,431 in 1880; 148,729 in 1890; and 160,949 in 1900. The numerical superiority of females is very pronounced, the proportion between the sexes having been 113 to 100 in 1890.

Ghent is mentioned in history as early as the seventh century. About the year 868, Baldwin Bras-de-fer, the first Count of Flanders, built a fortress here as a defense against the Northmen. Under the counts of Flanders, Ghent continued to prosper and grow until, in the fourteenth century, it was able to send 50,000 men into the field. The wealth of the citizens of Ghent, and the unusual measure of liberty which they enjoyed, encouraged them to resist with arms any attempt to infringe upon their peculiar rights and privileges. This readiness to arm in their own defense is exemplified in the struggles in which Jacob and Philip van Artevelde (qq.v.) played a memorable part. For many years Ghent maintained a vigorous but unavailing resistance against the dukes of Burgundy, who sought to be recognized as counts of Flanders. In 1540 the city, having ventured to defy the Emperor Charles V. (a native of the place), was terribly chastised and deprived of its liberties. In the various wars in which the Netherlands have been the battleground, Ghent suffered severely, and was frequently taken. For twenty years, from 1794, Ghent belonged to France, and was the capital of the Department of the Scheldt.

GHENT, TREATY OF. A treaty between the United States and Great Britain, which ended the war between the two countries known as the 'War of 1812.' The American negotiators were John Quincy Adams, James A. Bayard, Henry Clay, Jonathan Russell, and Albert Gallatin. Of these Bayard and Gallatin had been sent to Saint Petersburg in 1813, to join Adams in action upon Russia's offer of mediation, under express instructions to secure a stipulation against impressment. Russia's good offices were declined by England, while the termination of the Napoleonic wars so altered conditions that the American commissioners were given less stringent instructions both as to impressment and as to the fisheries. The British representatives were Lord Gambier, Henry Goulburn, and William Adams. After prolonged negotiations the treaty was signed by the respective commissioners on December 24, 1814, was ratified by the United States Senate on February 17, 1815, and was formally proclaimed by President Madison on the following day. Its main provisions were: (1) Restoration of all territory, places, and possessions taken by either party from the other during the war, except certain islands; (2) Article IV. provided for the appointment of a commission to decide to which of the two powers,

according to the boundary stated in the Treaty of 1783, certain islands in and near Passamaquoddy Bay belonged; and the commission failing to come to a decision, the subject was to be referred to some friendly sovereign or State; (3) Articles V.-VIII. provided for commissions to settle the line of boundary as described in the Treaty of 1783—the commission to settle the line from the River Saint Croix to where the forty-fifth parallel cuts the River Saint Lawrence (called the Iroquois or Cataragua in the treaty); another to determine the middle of the water communications from that point to Lake Superior; and a third to adjust the limits from the water communications between Lakes Huron and Superior to the most northwestern point of the Lake of the Woods; and (4) Article IX. bound both parties to use their best endeavors to abolish the slave trade, as being 'irreconcilable with the principles of humanity and justice.' The treaty failed, however, to speak of the impressment of American seamen, the chief cause of the war, or of the claims of the United States to participate in the Newfoundland fisheries, recognized in the Treaty of 1783, or of the question as to British and American naval forces on the northern lakes, or the rights of neutrals. All these questions, especially that as to the fisheries, became the subjects of much subsequent negotiation.

GHENT, UNIVERSITY OF. A Flemish university founded by King William I. of Holland, in 1816. It was housed in the town hall until 1820, when the old Jesuit college was remodeled for its use. At the time of the revolution of 1830 the university was seriously crippled by the suppression of two of its four faculties; in 1835, however, these were restored. Various special schools have been, from time to time, merged in the university. There are about 750 students, including over 100 foreigners. As in Liège, the institution is maintained by the State. The libraries of the city and university are combined in one collection, containing over 350,000 volumes, especially rich in the history and literature of the Netherlands; there are also many valuable manuscripts.

GHERARDESCA, gā'rār-dēs'kà. An Italian family of Tuscan origin, which enacted a conspicuous part in the history of the Italian republics in the thirteenth and fourteenth centuries. Their large territorial possessions lay between Pisa and Piombino. In the thirteenth century the counts of Gherardesca exercised a preponderating authority in the Republic of Pisa, and were at first prominent Ghibellines, and enemies of the Visconti of Milan, who headed the Guelphs, but later seemed inclined to favor the Papal party. The most celebrated of this family is Count Ugolino della Gherardesca, whose name and fate have been invested with undying interest by Dante in the *Inferno*. Count Ugolino, according to Ghibelline accounts, was possessed of a lawless ambition and a subtle unscrupulous spirit. Allying himself with the Guelph forces of Florence and Lucca, he compelled the Pisans in 1276 to restore him his territories, of which he had been deprived. No sooner was he reinstated in his possessions than he began to devise anew ambitious schemes. The war of the Pisans with the Genoese afforded him the opportunity he desired. In the battle of Meloria, 1284, Ugolino is said to

have contrived the defeat of the Pisans. He was, however, named Captain-General for ten years. From the time of his election he gave free scope to his vindictive nature, persecuting and banishing all who were privately obnoxious to him, till at length a conspiracy was formed against him, headed by his former supporter, the Archbishop of Pisa. He was thrown into the tower of Gualandi with two sons and two nephews, in 1288, where they all perished by starvation, for which reason their dungeon has since borne the name of the Tower of Hunger. In the fourteenth century the family again rose into importance, and several members were prominent in the service of Pisa. Consult: Sismondi, *History of the Italian Republics* (New York, 1870); G. del Noce, *Ugolino della Gherardesca* (Rome, 1890).

GHERARDI, gâ-râr'dê, BANCROFT (1832-1903). An American naval officer. He was born in Jackson, La., served as midshipman in the navy from 1846 to 1850, and entered the Naval Academy in 1852, where, in the same year, he was promoted to passed midshipman. During the Civil War he commanded successively the *Chocorua* and the *Port Royal* of the West Gulf Blockading Squadron, and with the latter vessel pursued the Confederate gunboats *Morgan*, *Gaines*, and *Selma*, during the battle of Mobile Bay (August 5, 1864). After the war he attained the rank of rear-admiral in 1887; commanded the Brooklyn Navy Yard (1887-89; 1893-94); and in 1893-94 was commander-in-chief of the North Atlantic Squadron. He was in charge of the Columbian international naval parade and review in New York Harbor in 1893, and was vice-commander of the New York Military Order of Foreign Wars. He was retired from active service in 1894.

GHERARDI DEL TESTA, gâ-râr'dê del tês'tâ, Count TOMMASO (1818-81). An Italian dramatic writer, born at Terricciola (Province of Pisa). He studied at the University of Pisa, fought against Austria in 1848, and in addition to his activity in the practice of law at Florence wrote poems, works of prose, fiction, and more than forty comedies. These last, his most important work, excel in dialogue and character-drawing, but often fail of adequate dramatic structure. They include *Il sistema di Giorgio* and *Il padiglione delle mortelle*, and were collected in 1856-66, and more completely in 1872-83.

GHETTO, gêt'tô (of doubtful etymology; possibly from It. *borghetto*, little town, diminutive of *borgo*, town). A Jewry. Originally the name 'ghetto' was applied to the Jews' quarters in several cities of Italy and Bohemia; but it is now popularly used of the part of any city where Jews are numerous. Both the name and the thing originated in Rome, in the time of Pope Paul IV., who first compelled the Jews to dwell within an inclosure set apart for them on the left bank of the Tiber, between Ponte Sisto and Ponte San Bartolommeo, and forbade their appearance outside of that quarter unless the men wore a yellow hat and the women a veil of the same color, to distinguish them from Christians. This ghetto was removed in 1885. See Philipson, *Old European Jewries* (Philadelphia, 1894).

GHIBELLINES, gîb'el-lînz or -lênz. See GUELPHS AND GHIBELLINES.

GHIBERTI, gâ-bâr'tâ, LORENZO (1378-1455). A Florentine goldsmith, and one of the chief

sculptors of the early Renaissance. He was the son of Cione di Ser Buonaccorso and Madonna Fiore, a lady of distinguished Florentine family. His mother left his father soon after his birth, but Lorenzo found a foster-father in the goldsmith Bartolo Ghiberti, with whom she lived, and who married her after her first husband's death. He adopted the lad and taught him his art, but Lorenzo was more drawn to painting, which he studied, perhaps under Gherardo Starnini. Fleeing from the pestilence in 1400, he went to Rimini, where he decorated a room of the palace of Carlo Malatesta. He returned to Florence, notwithstanding the inducements offered by Malatesta, in response to a letter from his stepfather, in 1401. The Merchants' Guild had decided to adorn the baptistery with two new bronze doors, and the signory invited all the artists of Italy to compete. Among the competitors of Ghiberti were Brunelleschi, Jacopo della Quercia, and Niccolò d'Arezzo. The subject to be presented was a bas-relief of the "Sacrifice of Isaac."

Ghiberti was much aided by the counsel of his adopted father, who criticised his designs, and submitted them to competent citizens and strangers before the final one was cast. The judges were unable to decide between Ghiberti and Brunelleschi. Both of the winning designs are preserved in the Museo Nazionale, Florence, and Ghiberti's certainly appears superior in both composition and line. Recognizing this, Brunelleschi generously withdrew, and on November 14, 1403, the commission was awarded to his rival.

The doors were not completed and set up until April 14, 1424. Ghiberti made use of a number of assistants, among whom we find Donatello and Michelozzo, and was much aided by his stepfather. Twenty of the panels represent scenes from the "Life of Christ"; four are devoted to the "Fathers of the Church," and four to the "Evangelists." These representations fulfill the highest demands of relief, and, considered as reliefs, stand higher than those of the more celebrated east portal. Among the best of the panels are the "Annunciation," the "Raising of Lazarus," the "Kiss of Judas," the "Birth of Christ," the "Purification of the Temple," and the "Youthful Christ Teaching." The figures of the "Evangelists" and of the "Fathers of the Church" are dignified and admirably draped, especially Saint Matthew. All of the reliefs show reminiscences of the Gothic, especially in the garments, but the ornamentation is antique. The corners of the panels are decorated with heads of prophets and sibyls.

The north portals gave such satisfaction that on January 2, 1424, Ghiberti received an order for the east gate—the famous "Paradise Portals." The subjects for these were selected from the Old Testament by Leonardo Bruni, the Chancellor of the Republic, but the designs were by Ghiberti himself. The technical skill displayed in handling relief is most remarkable; the composition is faultless, and sometimes four different subjects are handled in the same fashion, and yet without conflict. In some panels there are as many as one hundred figures, with architectural and landscape backgrounds.

Among the finest reliefs are the first, representing in one panel the "Creation of Adam," the "Creation of Eve," the "Fall of Man," and the "Expulsion from Paradise." In these the



GHIBERTI
BRONZE DOORS OF THE BAPTISTERY, FLORENCE

groups of angels accompanying the Creator are especially beautiful. Another fine panel is "Moses upon Sinai," in which we see the expectant, terrified throng of the Israelites below, among whom is the famous group of a "Mother and Her Children." Equally beautiful are the twenty-four statuettes of prophets and other scriptural personages, by which the panels on each portal are surrounded. There are also heads of prophets and sibyls at the angles of each relief, among which are two especially interesting ones, representing Ghiberti and his stepfather. The door-frame is carved with tasteful Renaissance ornamentation of foliage and animals.

While executing these two great works Ghiberti found time for others. Among these were two fine bronze reliefs for the font of the Baptistery of Siena (1417-27), representing episodes from the "Life of John the Baptist." Between 1432 and 1440 he also designed the bronze shrine of Saint Zenobius, in the Cathedral of Florence, the front of which contains a beautiful relief of the "Saint Restoring a Dead Child to Life," and the back six angels in relief. He also designed a grave-slab for Leonardo Dati, who died in 1423, in Santa Maria Novella, and two others in Santa Croce, all of which are much defaced by treading.

Ghiberti's chief strength, however, was in relief work on a small scale. Accordingly, we find in him the most celebrated goldsmith of his day. None of his works as a goldsmith survives, but in his second *Commentary* he himself mentions the principal examples. In 1419 he made for Pope Martin V. a mitre, covered with leaves of gold, among which were many different figures, and a cope button, adorned with a figure of Christ. He made another mitre in 1439 for Pope Eugenius IV., containing precious stones worth 38,000 ducats, and surmounted by figures of Christ and the Virgin with angels. He also set an antique intaglio, belonging to Giovanni de' Medici, between the wings of a golden dragon, crouching in a bed of ivy-leaves.

In statuary Ghiberti was less successful. He executed but three statues in bronze, all of which adorned the façade of Or San Michele. "John the Baptist" (1414) is the earliest example, quite in the style of the first portal; "Saint Matthew" (1420-22), cast with the aid of Michelozzo, looks like a Roman orator; "Saint Stephen" (1428) is the finest of all, simple in treatment and graceful in line.

Ghiberti also figured as an architect. He is mentioned in the record of 1520 as an associate of Brunelleschi in building the cupola of the cathedral at Florence; but if we may believe Vasari, he solicited this position, and perpetually annoyed his colleague by his endeavors to steal his plans. Brunelleschi feigned illness, and Ghiberti's incompetency became apparent. Whether or not this story be true, Ghiberti's *Treatise on Architecture*, which survives in manuscript form, certainly shows incompetency. As a designer for glass-painting he had greater success. Some of the finest glasses in the cathedral in Florence were carried out after his designs by Bernardo di Francesco, including those of the Chapel of Saint Zenobius, the middle window of the façade, and one in the drum of the cupola. As a citizen of influence Ghiberti was selected Chief Magistrate of Florence, and presented by the signory with a farm near Settino, in recognition

of his services as an artist. He died December 1, 1455, and was buried in Santa Croce.

His son and pupil, VITTORIO, was a sculptor and goldsmith of note, who assisted his father in the second door. In 1454 he made a design for the tapestry of the tribuna of the Palazzo della Signoria, and in 1478 a bronze reliquary for the cathedral. Among Ghiberti's other pupils and assistants were Michelozzo, Lamberti, and Antonio Pollajuola.

BIBLIOGRAPHY. Ghiberti himself wrote a work, the *Commentarii*, or commentaries on the art of Florence, in which he did ample justice to himself. It is preserved in manuscript form in the Biblioteca Magliabecchiana, Florence, and was published in Lemonnier's revision of Vasari's lives (Florence, 1846-57). There is a French translation in Perkins, *Ghiberti et son école* (Paris, 1897). The other chief source for his life is the biography in Vasari, *Vite*, edited by Milanese, vol. ii. (Florence, 1878-85), English translation by Blashfield and Hopkins (New York, 1897). The chief modern work on Ghiberti is that of Perkins, cited above. Consult also: Perkins, *Tuscan Sculptures*, vol. i. (London, 1867); Scott, *Ghiberti and Donatello* (London, 1882); Rosenberg, "Lorenzo Ghiberti," in Dohme, *Kunst und Künstler Italiens*, vol. i. (Leipzig, 1878); and Reymond, *La sculpture florentine* (Florence, 1898-99).

GHİKA, gē'kă. A princely family which gave a number of hospodars to Moldavia and Wallachia. The founder of the house was George Ghika, an Albanian by birth, who, through the favor of his compatriot, the Grand Vizier Mohammed Kiu-prili, was raised to the dignity of Hospodar of Moldavia in 1658, and for a brief period (1660) was also Hospodar of Wallachia. His son, Gregory Ghika, ruled in Wallachia from 1660 to 1664, and from 1672 to 1674, and received from the Emperor Leopold I. the title of Prince of the Holy Roman Empire. Of subsequent members of the family those calling for special notice are Alexander, Gregory, Jon, and Helena, though the family as a whole has been active in Rumanian affairs, and always associated with the Liberal and Nationalist Party.

ALEXANDER GHİKA X. (1795-1862) became Hospodar of Wallachia in 1834. He founded schools for primary instruction in every village, lightened the burdens of the peasantry, began the enfranchisement of the gypsies, and assisted in the organization of a national party, known as 'Young Rumania.' Russia took alarm and gradually, under her influence, a twofold opposition was excited against him, on the part both of the extreme liberals and of the old boyars or landed proprietors, who formed the Conservative Party, and were his personal enemies. After many intrigues he was removed from his office in 1842. He died in 1862. Consult Bibesco, *De la situation de la Valachie sous l'administration d'Alexandre Ghika* (Brussels, 1842).

GREGORY GHİKA (1807-57) was one of the chiefs of the liberal opposition in Moldavia under the Hospodar Michael Sturdza (1834-49), whose selfish policy was subservient to the designs of Russia. In 1849 the Sultan appointed him Hospodar of Moldavia. Hampered during a part of his tenure by the Russian occupation, he was able to accomplish much when freed from this impediment. He organized a good police system, augmented the effective force of the militia, founded

schools for superior and secondary instruction at Galatz, Hush, and elsewhere, promulgated an administrative code—the first great step toward the reform of abuses—increased municipal resources, and at his own expense built aqueducts and printed important historical manuscripts. He brought about a radical reform of the penitentiary system, the abolition of serfdom (1855) and of the censorship of the press (1856), and the establishment of foreign merchant companies for the navigation of the Pruth and the Sereth (1856). He encouraged the growth of a spirit of unity among the peoples of Moldavia and Wallachia. In 1856 Gregory was superseded in his office and went to reside in France. He committed suicide, August 26, 1857, at Meudon.

JON GHİKA (1817-97), a nephew of Alexander X., was born at Bucharest, and after studying at Paris became, in 1842, professor of mathematics and political economy at the University of Jassy. Having become a member of the national party which opposed the establishment of Russian domination in Wallachia, he was one of the leaders of the revolution of June, 1848, which resulted in the overthrow of the Hospodar, George Bibesco. He was sent by the short-lived Provisional Government as diplomatic representative to Constantinople, where his exceptional abilities gained him the favor of the Sultan, who in 1856 made him Prince of Samos. He returned to Wallachia in 1857, served in the Ministerial Council under Prince Alexander John Cuza, and was twice Premier under his successor, Prince Charles of Hohenzollern, 1866-67 and 1870-71. From 1881 to 1889 he was Ambassador at London. He died at Bucharest, May 4, 1897.

HELENA GHİKA. See DORA D'ISTRIA.

GHILAN, or **GILAN**, gè-lân'. A border province of Persia, occupying a narrow strip of land along the Caspian Sea (Map: Persia, C 3). Its area is estimated at over 6000 square miles. The coastland is low and overgrown with thick forests, while the southern part partakes of the character of the Elburz region. The climate is moist and unhealthful. The well-watered and fertile coastland produces rice, peaches, figs, and other southern fruits. In the more elevated regions grain is grown and cattle are reared. Silk and oil of roses are produced extensively. The population, estimated at about 200,000, is made up of the aboriginal Iranians, with Kurdish and Turkish immigrants. They speak either a Persian dialect, termed Gileki, or Tat, which is a pure Iranian tongue. In religion they are mostly Mohammedans and belong to the Shiite sect. The principal town is Resht (q.v.).

GHILZĀIS, gèl-zî'ez. A tribe of Pathan stock in Eastern Afghanistan, Aryan by language. Holdich (1899) considers them as ultimately of Turkish origin, but this lacks proof. They are a very warlike and restless people.

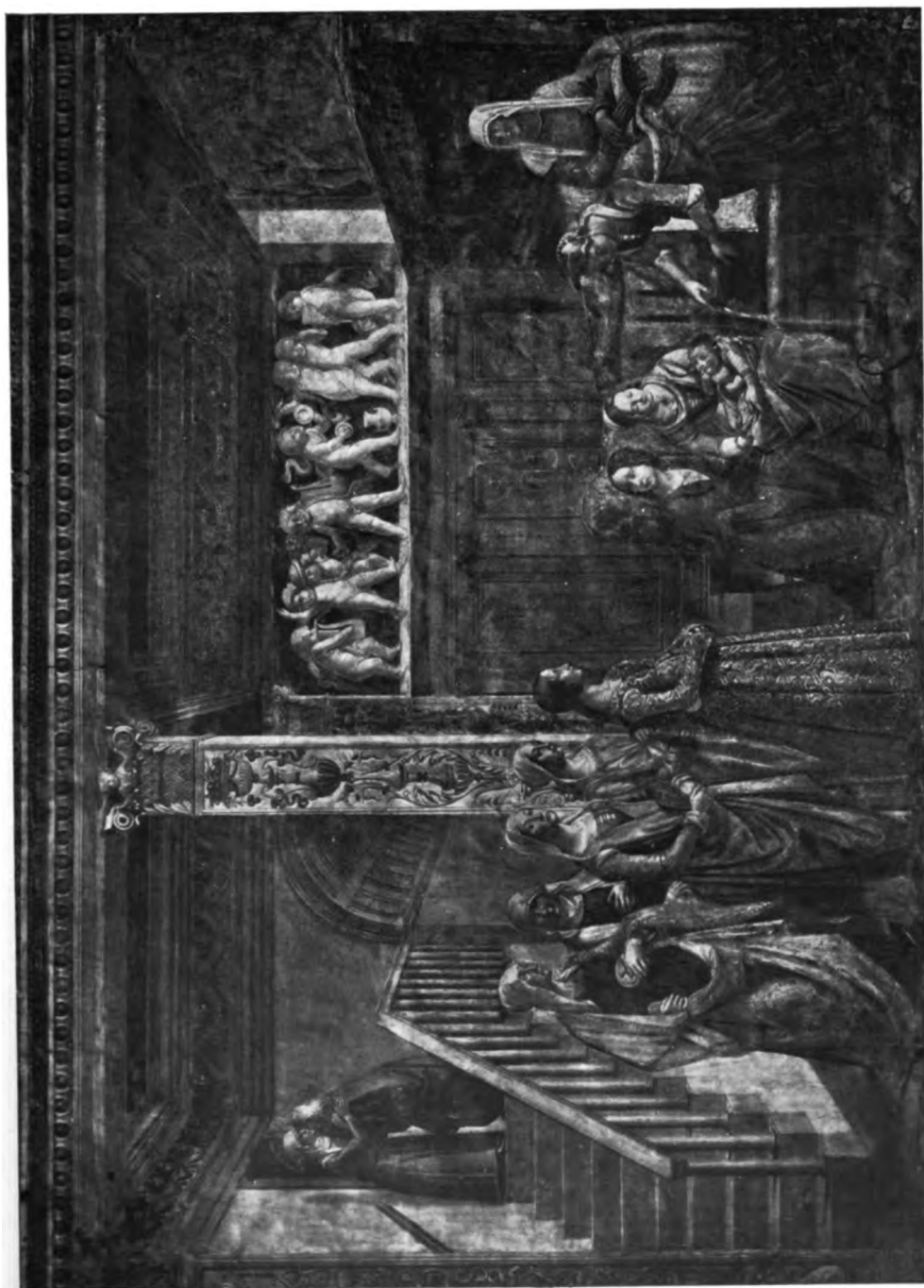
GHIRLANDAJO, gèr-lân-dâ'vò. A family of Florentine painters. Their real family name was Bigordi, and the name Ghirlandajo or Grillandajo (garland-maker) was first given to TOMMASO BIGORDI, a goldsmith, because he invented a fashionable silver wreath, used in ladies' head-dresses. His son DOMENICO (1449-94), the chief member of the family, was born in Florence, and brought up in his father's trade. He studied painting and mosaic under Alesso Baldovinetti, and was also influenced by Castagno

and Verrocchio (q.v.). The earliest record of his activity is in 1475, when we find him employed in the Vatican library at Rome. The works executed there have been lost, but there is a possibility that his fresco "Call of Saints Peter and Andrew," in the Sistine Chapel, was painted then, although it is usually assigned to 1485. It is, perhaps, the best of the fifteenth-century paintings of the Sistine Chapel, being excellent in composition, with good landscape and perspective; the color is unattractive. His frescoes in the Capella Fina, in the Collegiate Church of San Gimignano, treating the "Life of Saint Fina," were completed, for the most part, before 1475. They are especially remarkable for the modesty and grace of the female figures. The frescoes in Ognisanti, Florence, finished in 1480, show the painter fully developed. Of these only two paintings survive, the "Last Supper" and "Saint Jerome." The former is probably the best representation of the subject painted in the fifteenth century, and far excels his later fresco of the same subject in San Marco. His Saint Jerome is a companion piece to Botticelli's Saint Augustine. From 1481 to 1485 Domenico was occupied in the Palazzo Vecchio, Florence, which in point of historic decoration was long the rival of the Sistine Chapel at Rome. Of all its frescoes only Ghirlandajo's survive, and of these the decorations of the chapel have been spoiled by restoration. His "Saint Zenobius Enthroned" is a grand architectural composition.

On December 15, 1485, he completed the frescoes of the Sassetti Chapel in Santa Trinità, Florence. The figures of the donor and his family on either side of the altar are comparable in the dignity of their realism with those of the Ghent altar by the Van Eycks (q.v.). The frescoes represent scenes from the life of Saint Francis, and show the decided influence of the same subject by Giotto in Santa Croce. The heads are nearly all portraits, and the scenes are set amid views of Florence. This work is better in color and in technique than any of his previous productions; but the finest of his frescoes are those in the Tornabuone Chapel, Santa Maria Novella, finished in 1490. Here, too, are figures of the donors; in lunette above is God the Father surrounded by the patron saints of Florence. Below them are the "Annunciation" and the "Baptist" on either side, typifying the subjects of the frescoes represented, that is to say, the "Legend of the Virgin" and the "Life of John the Baptist." On the vaulted roof are frescoes representing the "Four Evangelists."

Domenico's easel pictures are not of equal importance; his art was more adapted to monumental fresco. Among his chief easel pictures, all of which are painted in tempera, are the altarpiece of the Sassetti Chapel (1485), now in the Uffizi; "Coronation of the Virgin" (1486), in the Palazzo Publico, Narni; the circular "Adoration of the Kings" (1487) in the Uffizi, and the altarpiece of Santa Maria degli Innocenti representing the same subject. The latter is one of his best works. A dignified work is the "Virgin Enthroned," now in the Uffizi. The altarpiece of Santa Maria Novella (1490) is divided between Berlin and Munich, and his last easel picture, "The Visitation" (1491), is in the Louvre.

Domenico passed practically all his life in Florence, where he died January 11, 1494. He was the painter *par excellence* of Florentine life.



GHIRLANDAJO
"NATIVITY OF THE VIRGIN MARY," FROM THE FRESCO IN THE CHURCH OF SANTA MARIA
NOVELLA, FLORENCE

He represents the highest development of realism in the art of his century. He united in himself in a remarkable manner all the tendencies of Florentine art, ancient and modern, Masaccio, even Giotto, having influenced him. From the purely technical side he was one of the greatest painters that Florence ever produced. Although somewhat lacking in originality, he excelled in composition, was a fine draughtsman, and, for Florence, an excellent colorist.

DAVIDE (1452-1525) and BENEDETTO GHIRLANDAJO (1458-97), brothers and pupils of Domenico, assisted their brother, but painted no independent works that survive. The mosaic of the "Annunciation" over the first north portal of the Cathedral of Florence is the work of Domenico and Davide. Among Domenico's other pupils were his brother-in-law Bastiano Mainardi, Francesco Granacci (q.v.), and, for a brief time, Michelangelo.

RIDOLFO (1483-1561), son of Domenico, was eleven years old when his father died, but received his artistic education in his father's studio, which was conducted by Granacci and Davide Ghirlandajo. He assisted the former in some of his works, but about 1503 he came wholly under the influence of Leonardo da Vinci (q.v.), and painted a number of excellent works, which are hardly to be distinguished from Leonardo's. In fact, paintings formerly attributed to the latter, like the "Annunciation" in the Uffizi, the "Goldsmith" in the Pitti Palace, and the portrait of an "Old Man," in Palazzo Torregiani (Florence), are by Ridolfo. His best works of this character are the "Coronation of the Virgin" (1503), in the Louvre, and the altarpiece of San Jacopo in Ripoli (1505), and the "Betrothal of Saint Catherine." Somewhat later he came under the influence of Raphael, as may be seen in his excellent portrait of an "Old Woman" (1509) in the Pitti Palace. He is reputed by Vasari to have assisted Raphael in the draperies of the "Belle Jardinière," but to have refused an invitation by him to settle at Rome. His most ambitious works are the "Coronation of the Virgin," the altarpiece of the Cathedral of Prato; the "Virgin Adored by Saints," altarpiece of San Pietro Maggiore, Pistoja; and two scenes from the "Life of Saint Zenobius," in the Uffizi. In later life his profession degenerated into a trade; he employed a large number of assistants, and his work became mannered and stiff.

Consult: Vasari, *Vite*, ed. Milanese, vol. ii. (Florence, 1878-85); English translation by Blashfield and Hopkins (New York, 1897); Crowe and Cavalcaselle, *History of Painting in Italy* (London, 1866); Lübke, *Geschichte der italienischen Malerei* (Stuttgart, 1878-79); Steinmann, "Ghirlandajo," in Knackfuss, *Künstler-Monographien* (Bielefeld, 1897); Woltmann and Woermann, *History of Painting*, vol. ii. (New York, 1901).

GHISLAIN, gēs'lān'. See MÉRODE, FRANÇOIS XAVIER.

GHISLANZONI, gēs'lān-zō'nē, ANTONIO (1824-93). An Italian singer and author, born at Lecco. He was a singer in the Milan theatre, and when he lost his voice became a journalist, founded the satirical paper *L'Uomo di Pietra* (1857), and was editor of the *Gazzetta Musicale*. He wrote a number of books for opera, among them the libretto of Verdi's *Aida*, and several

novels, including *Gli artisti da teatro* (1865) and *Le donne brutte* (1870).

GHIZEH, or GIZEH, gē'ze. An Egyptian village on the left bank of the Nile, opposite the island of Roda and about three miles from Cairo. Although now fallen into decay, it is said to have once contained magnificent palaces which, in later times, the Mameluke princes used as a summer residence, and it was a place of some importance in the Middle Ages. Near Ghizeh is the viceregal palace, originally built for a harem, which in 1889 became the repository of the great collection of Egyptian antiquities removed in that year from Bulak. The collection has recently been transferred to Cairo. The great Pyramids (q.v.) lie about five miles west of Ghizeh.

GHIZNI, gīz'nē. See GHAZNI.

GHO'GRA. See GOGRA.

GHOR, gōr. See EL-GHOR.

GHORKAR, gōr'kār (Pers. *gōrkhar*, wild ass). The name in Western India and Beluchistan for the local variety of the Asiatic wild ass, which differs from the *kiang* in being somewhat paler, less reddish in color, and having a broader dorsal stripe. See KIANG.

GHOST MOTH. A moth (*Hepialus humuli*) very common in many parts of Great Britain, and of which the caterpillar, known as the 'otter,' often commits great ravages in hop plantations, devouring the roots of the hop. It feeds also on the roots of the nettle, burdock, and some other plants. This moth belongs to a family (Hepialidæ) often called swifts from their rapid flight. The male ghost moth is entirely of a satiny white color above, the female yellowish with darker markings; both sexes are brown on the under side. They are to be seen flying about in the twilight, not unfrequently in churchyards, from which circumstance, and from the white color of the males and their sudden disappearance in the imperfect light, they derive their name. The caterpillar, which is sometimes two inches long, is yellowish white, with scattered hairs. It spins a large cylindrical cocoon among the roots on which it has been feeding, and there becomes a chrysalis. The family is represented in North America by species harmful to the alder and other trees.

GHOSTS (AS. *gāst*, OHG. *geist*, Ger. *Geist*; ultimately connected with OIr. *goet*, wound, Skt. *hēdas*, wrath). The spirits of the dead as manifested to the living. The belief in ghosts is one of the earliest of all religious phenomena, and forms the foundation of many concepts and practices in cults from the most primitive faiths to the most highly spiritual. It is found in one form or another at all ages and among all peoples. To such an extent does belief in ghosts prevail, that one school of comparative religion (see RELIGIONS, COMPARATIVE), of whom Herbert Spencer and Julius Lippert are the chief representatives, has sought to find the origin of all religion in ghost-cults. This view must be regarded, however, as an erroneous, because one-sided, theory, but the importance of ghost-worship as a religious factor cannot be denied, and it is certainly one of the main sources of religious belief. Its chief development is found in the widespread existence of ancestor-worship,

as will be explained. It is also the foundation of all eschatology (q.v.), or belief in future life. The notion of survival of a certain mysterious part of man, which may be called conveniently the soul, is found at a very early stage in religious development. Whether this belief is, and always has been, universal is a problem which may be insoluble. While many observers deny the existence of ghost-belief as well as of all religious concepts among certain extremely primitive peoples, as the Andaman islanders, a prudent skepticism renders one distrustful of their conclusions, for it may be stated as a general fact that religious beliefs are particularly liable to concealment and to misinterpretation. This reticence may be due either to lack of method or to misunderstanding on the part of the investigator, or to a fear entertained by the individual questioned lest the knowledge gained from him may be used to his hurt.

The ghost-concept in its most primitive form seems to be developed as follows: The phenomenon of dreams is one of the starting-points. According to the reasoning of the primitive mind, the self, while the body is unconscious and inert, wanders to places familiar or even unknown, experiences pleasure and pain, converses with friends perhaps dead, and performs other things which have no connection with the body. It is therefore a dangerous thing, in the belief of many savage tribes, to wake a sleeper suddenly, lest his soul may not return in time. Among some peoples the soul is even supposed to assume a visible shape, as that of a mouse, which comes from the sleeper's mouth. From sleep and dreams the savage proceeds by analogy to death. To him the distinction between slumber and death is one of degree rather than of kind, and it is well known how universal is the belief that sleep and death are near akin. As in slumber the soul left the body for a time, but returned to it, so in the long sleep, as the primitive mind regards it, of death, the soul is supposed to remain near the body. This belief, for instance, is found even in such developed faiths as Parsiism and Mohammedanism, while other religions, as the ancient Egyptian, teach separate phases of the soul, one of which, like the Egyptian *ka*, remains near the corpse. As it is obviously impossible to keep a corpse from dissolution, and as the progress of decay renders the body more and more uninhabitable for the spirit which has left it, the soul, or the ghost as it may now be called, becomes a source of much anxiety to the kinsmen and other friends of the dead. It must be borne in mind, as has been stated in the article on demonology (q.v.), that in primitive religion the element of terror is one of the most important factors, and at first exercises a far greater influence than hope. The ghost is, then, more terrible than was the man whose body it had animated. It is no longer limited by bodily restrictions, it can traverse space with infinite speed, and may be invisible. Fortunately, and somewhat curiously, the ghost, like demons generally, is rather stupid, and is also bound by certain limitations. Upon such an apparently flimsy foundation, which is, however, logical to the primitive man, is built a complicated system of mortuary customs (q.v.), and the concept of immortality. The ghost, which, as has been said, delights to hover around its earthly home, is

not a cheerful companion to the living, and must therefore be kept away. This is accomplished by various methods, as by building a new hut for the survivors, or, more easily, by carrying the corpse out by a hole broken in the side of the dwelling, which is subsequently walled up. The ghost is then unable to find its way back, and the house is safe from its invasion. The superstition here noted still survives. The so-called haunted houses and haunted rooms are cases in point, and it is important to note that it is the malignant ghosts, chiefly those who have been involved in murder or other evil acts, which especially linger around the scene of their earthly activities. The beneficent ghost plays but a small part as compared with the maleficent one. To avert the influence of maleficent ghosts, who have already been considered under the title demonology (q.v.), various forms of sacrifice and magic are employed. These ceremonies have as their primary object the satisfaction of the ghost's wants. These needs are conceived as being practically the same as they are on earth. Thus the bow and arrows are laid with the warrior, a woman's jewelry is buried with her, and a child's toys rest beside its body. It was also common in many places, notably in Dahomey and Polynesia, to sacrifice slaves to attend their master in the spirit world, while among the ancient Germans horses and even wives (as in the Indian suttee) were often slain at the funeral pyre. It is also probable that to the wish to appease ghosts many of the elaborate mourning customs of primitive peoples may be traced. Under this category come such acts as shaving the hair, cutting the flesh, fasting, neglect of the toilet, use of unbecoming clothing, and the like. It is, of course, true that at a comparatively early time the development of civilization rendered mourning for the dead an act of affection and not of fear; but it is hard to believe that the savage who put to death the aged members of his tribe was moved by any high ideals in the beginning of mortuary customs. In line with mourning are the offerings of food, drink, clothing, and, as in China, of money to the deceased.

Thus is evolved one of the most widely spread of all cults—ancestor-worship. Gradually beside the malignant ghost the benignant one appears, and by a process quite as natural. The interest which the father during his lifetime feels in his family is logically continued after his death, when the social life becomes more stable. It is also proper that his sons should be the ministers of this cult, and thus the imperative necessity felt among many peoples for sons. If a man dies sonless, his ghost will lack care, and the ancestor-cult therefore exercises a far-reaching influence on early family life. As already noted, however, this worship has its limitations. Even among civilized races, except in the comparatively rare instances where genealogical tables are constructed, men seldom know the names of their ancestors further back than the fourth generation. Translating this into terms of primitive life implies that the ghosts of remote ancestors perish, or become absorbed into a vague spirit-world. This leads to the conclusion that all men do not necessarily become ghosts, or at least have but an evanescent ghosthood. It may be stated as generally true that only those men survive after death as ghosts who have been so re-

markable for some reason or other as to command special attention while living. This is clearly shown by the development of the immortality concept in Judaism. (See **ESCHATOLOGY**.) Not in ancestor-worship alone does the ghost play an important part. Many phenomena in nature-worship (q.v.) and in the various aspects of totemism (q.v.), including tree-worship and serpent-worship, are explicable only by the ghost-cult. On the other hand, ghost-worship is deeply influenced by magic (q.v.), especially in the evolution of the concept of the benignant ghost, to which allusion has already been made. Magic is, in its simplest terms, a means of control over supernatural powers. As the belief in magic increases, and as by implication its power increases, the ghost becomes less and less an object of fear, and in the same degree becomes more and more a beneficent spirit, until it is evolved in many instances into a guardian angel or some like concept. In this way the ghost idea may be traced from the primitive belief in life after the death-sleep, the care for such life and the avoidance of its ill will, the superhuman and generally malignant nature of that life, and its evanescence in the lapse of years, down to the benignant ghost, controlled at first by magic, which often acts as a guardian spirit, while the immortality concept, at first individual and temporary, finally becomes universal and eternal.

Consult: Spencer, *Principles of Sociology* (3d ed., 2 vols., London, 1885); Campbell, *Notes on the Spirit Basis of Belief and Custom* (Bombay, 1885); Jastrow, *The Study of Religion* (New York, 1902). See also **DEMONOLOGY**; **ESCHATOLOGY**; **MAGIC**; **MORTUARY CUSTOMS**; **RELIGIONS, COMPARATIVE**; **SUPERSTITION**; **TOTEMISM**.

GHOSTS. One of the most thrilling and powerful of Ibsen's dramas (1881). It shows the consequences of inherited evil, the ghosts that return; and gives a gloomy picture of the inevitableness of fate. Oswald Alving, son of a vicious father, whose past had been concealed, after a struggle becomes a physical wreck, and at the close begs his mother to end his torture with poison.

GHURI, گھورے. A Mohammedan dynasty which received its name from Ghur, a district of Afghanistan. Ten monarchs are included in this line, and their power lasted from about A.D. 1148 to about A.D. 1215. In 1148 ALA UD-DIN HUSAIN and his brothers, SAIF UD-DIN SURI and BAHU UD-DIN SAM, attacked and captured Ghazni (see **GHAZNIVIDES**), which was placed under Saif ud-Din. This prince was defeated by Bahram, Shah of Ghazni, in the following year, and was hanged. He was succeeded by Bahu ud-Din as ruler of Ghur, who died within the year, and was followed in turn by Ala ud-Din, who again captured Ghazni. Imprisoned by Sanjar in 1150, Ala ud-Din was released after two years and died at Herat in 1156, being succeeded by his son, SAIF UD-DIN MOHAMMED, who was followed seven years later by his cousin, GHIYATH UD-DIN. In 1173 the most famous prince of the line, MOHAMMED GHURI, who was to be the conqueror of Northern India, captured Ghazni, which had been lost, and began his career as a warrior. He took Lahore from Khusrû Shah, the last of the Ghaznivides, in 1181, and captured it again five years later. Mohammed's early attempts to conquer India were not successful, and he was

severely defeated by the Rajah of Delhi and Ajmere, near Thaneswar, between Delhi and Ambala, in 1191. In the following year the tables were turned; the Rajah was defeated and captured near the scene of his previous victory, and put to death. In 1193 Delhi was captured, and the first, or Turkish, dynasty of Delhi Sultans was founded there by MOHAMMED GHURI. The Sultan continued his conquests, defeating the Maharajah of Kanouj in 1194, thus extending his dominion to Benares. Within ten years his slave, Qutb ud-Din, had reduced Gujarat, and Mohammed Bakhtyar had subdued Oudh, Behar, and Bengal. In 1206 Mohammed Ghuri, who kept his court at Ghazni in Afghanistan, was assassinated while asleep in his tent on the banks of the Indus, and was succeeded by his nephew, GHIYATH UD-DIN MAHMUD. As so often happened at the death of an Oriental conqueror, the Empire was broken up, and the dead Emperor's slave, QUTB UD-DIN, was crowned Emperor of Delhi at Lahore, and began a career of conquest, extending his sway to the Brahmaputra River. The reigns of the Ghuri dynasty after Mohammed, comprising GHIYATH UD-DIN MAHMUD (1206-10), BAHU UD-DIN SAN (1210), ALA UD-DIN UTSUZ (1210-15), and ALA UD-DIN MOHAMMED (1215), are entirely without interest.

GHYCZY, g'ŷel, KÁLMÁN (1808-88). An Hungarian statesman, born at Komorn. He was elected to the Diet in 1843, and in 1848 appointed Under-Secretary of State to Deák in the Ministry of Justice, succeeding him as Minister in September of that year. In 1861 he was elected a Deputy and became president of the House, and subsequently opposed the compromise of 1867 with Austria, but in 1874 accepted the appointment of Minister of Finance in the Bittó Ministry. He was again chosen president of the House of Deputies in 1875, but retired from public life in 1879.

GIACOMELLI, zhá'kó'mél'lé, HECTOR (1822—). A French illustrator, engraver, and painter, born in Paris. His best-known work is perhaps his series of initials and marginal drawings for the Doré Bible, and his illustrations for J. Michelet's *L'insecte* (1876). He published in 1862 *Raffet, son œuvre lithographique et ses eaux-fortes*.

GIACOMETTI, jà'kó-mét'té, PAOLO (1816-82). An Italian dramatist, born at Novi Ligure. He studied law in Genoa, but became a playwright and wrote altogether more than eighty works of various degrees of seriousness and literary value. For several years he was author to a strolling troupe of players, and under contract to supply yearly a fixed number of pieces to the impresario of the band. Many of these compositions were written in a few weeks' time during severe illness. His most important drama is the tragedy *Sofocle* (1860). He wrote also numerous feuilletons. His dramatic works appeared in selection at Milan (8 vols.) in 1859-66.

GIACOMOTTI, zhá'kó'mó'té, FÉLIX HENRI (1828—). A French historical painter, born at Quingey (Doubs). From 1850, and after studying at the Ecole des Beaux-Arts, he was a pupil of Picot. In 1854 he won the Prix de Rome. He returned to Paris in 1861. Besides religious and principally mythological subjects, both of which he treats with equal finish and grace—the latter often with a touch of sensuality—he also painted

excellent portraits. His principal works include: "The Rape of Amymone" (1855, Luxembourg Museum); "Agrippina Leaving the Roman Camp" (1864, Lille Museum); "Christ Blessing the Children" and "Christ in the Temple" (both in Saint-Etienne du Mont, Paris); "Apotheosis of Rubens and of Painting" (1878, ceiling-piece in the Luxembourg); "Centaur and Nymph" (1880); and "Lady Macbeth" (1886).

GIAFAR, jâ'fâr. The companion of Harun-al-Rashid, the Caliph of Bagdad, in the *Arabian Nights*. The nightly expeditions of these two characters about the city streets form the thread by which the various stories are connected. Giafar holds the Court office of Grand Vizier.

GIANIBELLI, jâ'nâ-bê'lê, or **GIAMBELLI**, FEDERIGO (c.1530-?). A famous military engineer. He was born at Mantua, and after serving for some time in Italy, proceeded to Spain and offered his services to Philip II.; but abruptly quitted Madrid, and after residing some time at Antwerp, where he acquired a high reputation as a mechanician, passed over to England and entered the service of Queen Elizabeth, who granted him a pension. During the War of Independence in the Netherlands, Alexander, Duke of Parma, generalissimo of the Spanish forces, laid siege to Antwerp in 1584, whereupon Elizabeth commissioned Gianibelli to proceed to the assistance of the inhabitants. On his arrival he found that the Spaniards had built a vast bridge across the Scheldt, interrupting all communication with the sea, by which alone the city could get provisions or help. Early in 1585 Gianibelli carried out a plan for blowing up the structure by floating down rafts laden with vast quantities of explosives against it, which were to be set off by means of a mechanical contrivance. The ponderous structure was partially blown into the air, and no less than 800 men—among whom were some of the best Spanish officers—were killed. This achievement, however, was rendered unavailing by the singular remissness displayed at this juncture by the defenders and by the wonderful energy of the Duke of Parma, as well as the want of unity among the citizens, and Gianibelli was obliged to return to England. Here he was employed at the time of the threatened Spanish invasion in fortifying the coast-line, which he did in a very skillful manner. When the Armada appeared in the Channel, it was Gianibelli who proposed and carried out the plan of sending fire-ships into the midst of the enemy, who remembered too well Gianibelli's 'Hell-burners' of Antwerp to await their coming, and fled. Gianibelli died probably in London. The date of his death is not known.

GIANNI, jân'nê, LAPO. An Italian poet of the thirteenth century, the friend and contemporary of Dante, who wrote a sonnet to him and Guido Cavalcanti. Nothing is known of his life. Of his verse there remain twelve ballate, two canzoni, and a doubtful sonnet. These are described by G. Tropic in *Rime di Lapo Gianni* (Rome, 1872). Rossetti also speaks of him in his *Dante and His Circle* (London, 1874).

GIANNONE, jân-nô'nâ, PIETRO (1676-1748). An eminent Italian historian, born May 7, 1676, at Ischitella, in the Neapolitan Province of Capitanata. He early distinguished himself as a lawyer at Naples, and soon accumulated sufficient means to enable him to devote considerable time and energy

to historical research. Early in life he had conceived the idea of writing a history of the Kingdom of Naples, and now in his villa adjoining Naples he labored for twenty years at this, his greatest historical work, which he published in 1723 in four volumes, under the title of *Storia civile del regno di Napoli*. This valuable and comprehensive work not only treats of the civil history of the kingdom, but also contains learned and critical dissertations on the laws and customs and the administrative history of Naples, from the most remote times, tracing the successive working of Greek, Roman, and Christian influences on the legislative and social institutions. His severe strictures on the spirit and practices of the modern Roman Catholic Church so enraged the ecclesiastical party that Giannone was denounced and anathematized by the Church. The fanaticism of the lower classes was aroused by the calumnies leveled at the writer, who was finally excommunicated by the Archbishop of Naples, and forced to take refuge first at Venice, and later at Vienna, and other places. His history was condemned as heretical and libelous by the Pope. Giannone, however, was granted a small pension by the Emperor Charles VI. In 1734 he was deprived of this income, and removed to Venice, whence he was expelled, and forced to seek shelter in Geneva. There he composed his famous diatribe, entitled *Il triregno*, against the Papal pretensions, and proclaimed his adoption of Calvinistic doctrines. Shortly after, an emissary from the Court of Turin induced Giannone to enter the Sardinian States, where he was immediately arrested, and conducted to the fortress of Turin. He passed the long years of his prison life in the pursuit of his chosen studies, and retracted his change of religious opinions, a step which in no way improved his condition. He died a prisoner in the fortress, March 7, 1748, after an incarceration of twelve years. His *Opere postume* (Lausanne, 1700), and his *Opere inedite*, edited by Mancini (Turin, 1859), complete the list of his historical works. An English translation of his *History of Naples* appeared in London (1729-31). Consult: Panzani, *Vita di Giannone* (Naples, 1821); Pierantoni, *Autobiografia di Pietro Giannone, i suoi tempi e la sua prigionia* (Rome, 1890).

GIANNOTTI, jâ-nôt'tê, DONATO (1494-1563). An Italian historian, born in Florence. The flight of Pietro de' Medici, after the victory of Charles VIII. of France (1494), brought a republican régime to Florence. In this atmosphere Giannotti grew up, and became secretary to the Council of Ten (1527). When Alessandro de' Medici returned (1530) he left Florence, and lived most of the remainder of his life in Venice, in the service of Cardinal Ridolfi, in France, attached to the suite of Cardinal de Tournon, and in Rome as secretary of briefs (1571), whither he had been invited by Pope Pius V. The most important of his works are: *Della repubblica de Veneziani* (1540); *Della repubblica fiorentina* (1721); and *Vita di Niccolò Capponi* (1620). His *Opere politiche e letterarie di Donato Giannotti* were published with a biography by Vannucci (Florence, 1850).

GIANOZZO MANETTI, jâ-nôt'sô mâ-nêt'tê (1396-1459). An Italian humanist, born at Florence. He was educated for commercial affairs, but from 1421 identified himself with the

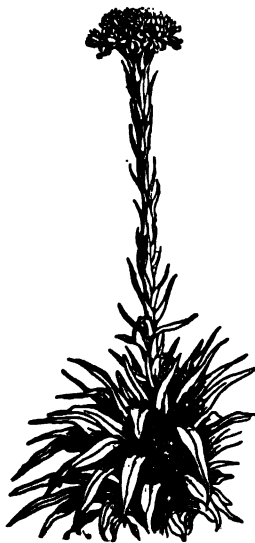
literary life of the time, studying Greek under Ambrogio Traversari, and acquiring from a Jewish tutor, called Manuel, a knowledge of Hebrew then unusual. On many occasions he was employed on important State missions, particularly as Ambassador to the Courts of Venice, Naples, Rome, and other Italian governments. His fame as an orator was great, and in connection with his eloquence many marvelous stories are preserved. So influential did he at last become that Cosimo de' Medici thought it prudent by oppressive taxes to drive him from Florence. He was then attached to the service of Pope Nicolas V., and later of King Alfonso of Naples. His learning was very extensive, and in his endeavors to effect harmony between Christian traditions and those of the rediscovered classical world he became one of the foremost exponents of the new learning. He quite lacked, however, the literary art, with the result that his works are often verbose and platitudinous. Among his writings are translations into Latin of the ethical treatises of Aristotle, the Psalms, and the New Testament, and a lengthy polemic, *Contra Judæos et Gentes*.

GIANT DESPAIR. See DESPAIR, GIANT.

GIANT KILLER. See JACK THE GIANT KILLER.

GIANT or SPEAR LILY (*Doryanthes excelsa*).

An Australian plant of the order Amaryllidaceæ, with flowering stem ten to fourteen, sometimes twenty feet high, bearing at top a cluster of large crimson blossoms. The stem is leafy, with the largest leaves near the root. This plant is found both on the mountains and along the seacoast of New South Wales and Queensland. It is of splendid beauty. The fibre of its leaves has been found to be excellent for ropes. Other species, as *Doryanthes Palmeri* and *Doryanthes Guilfoylei*, are fibre plants of similar habit. They yield a large quantity of white elastic fibre, that is especially adapted to cordage, mats, etc. It has



GIANT LILY.

also been successfully used for making paper.

GIANTS (OF. *geant*, *jaiaint*, Fr. *géant*, from Gk. *γίγας*, *gigas*, giant). Adult human beings over normal size. In each race of mankind there is a standard of average height for men and for women, and this rule extends to castes and crafts as well as to civic and urban populations. This shows how much more powerful the race has become than the individual. Tall parents often have short children, and vice versa, but the breed is uniform. The following table will show the average stature of men among the so-called gigantic races:

Race	Height in inches
Scotch, of Galloway.....	71
Scotch in general.....	69.5

Race	Height in inches
Livonians.....	69
Irish.....	69
Norwegians.....	68.5
English.....	68
Polynesians.....	68-69
Sikhs, Punjab.....	68
Fulahs of Sudan.....	69
Kafirs.....	68
Cheyennes.....	69
Patagonians.....	69

Between the Akkas, a dwarfish negro people in the forests of Central Africa (height, 53 inches), and the Scotch farmers of Galloway, there is a difference of 18 inches, and this difference is about the same as that between the average height of the whole human race and the tallest giants.

The question is still mooted among ethnologists whether these differences in racial stature are due to nature or to nurture. Doubtless both causes have always been at work. It was believed among the ancients that the first men on the earth were tall and mighty, and that they degenerated both in vigor and longevity. In contrast with this is the attempt to prove that the first men were dwarfish, and that the modern races of short stature are only survivals of the first men living on the outskirts of civilization.

The term giant is applied also to abnormally tall individuals among the different peoples of the earth. Stories are common among the lower civilized peoples, as well as among savage tribes, to the effect that men have lived who measured 15 feet in height. Og, King of Bashan, is said in Deuteronomy (iii. 11) to have been the last of the giants. His bedstead of iron was 9 cubits, or between 11 and 13½ feet, in length. Pliny mentions the name of an Arabian giant who measured 9½ feet, and also speaks of two others who were 10 feet in stature. Allowance is to be made, as in all other cases, for the imagination of the narrator. The following list of men whose real height is well known shows that it is possible for individuals to go far beyond the average of the human species, which is 65 inches:

	Inches
Magrath, Bishop Berkeley's giant.....	92
Patrick Cotter (1761-1804) or O'Brien.....	99
Charles Byrne, Irish giant.....	100
Topinard's Kalmuck.....	100
Winkelmaier, Austrian (d. 1887).....	108
Topinard's Finlander.....	112

It is conceded on the part of medical men who have studied the subject with great care that men of extraordinary stature have feeble viability. Giantism is often associated with acromegaly (q.v.), but is most frequently produced by excessive growth. Bishop Berkeley's experiment is interesting in this connection, since the excessive height of the man was due to special feeding. Natural giants or dwarfs, however, are abnormal, accompanied with sterility and other weaknesses.

The word 'giant' does not always refer to persons of tall stature or large size; but in mythology and folk-lore the title is given to men of great strength, or speed, or prowess. It is these physical heroes that form the connecting link between the mythic world and the world of sense. It is only a short distance across a narrow boundary to the province of the Jotuns and Titans and other giants of the imagination. The Nephilim and Goliaths of the Bible are only a little way

from Heracles and Typhoeus. The Cyclops Polyphemus has his legendary parallels among all peoples.

It has been suggested that the old-time and still existing belief that mankind has degenerated, the excavation of great fossil bones in the superficial layers of the earth's crust, the discovery by explorers in the last four centuries of the taller races of the earth, whose height was exaggerated by the terrors of being in a strange country—all these combined to fix the belief in the real existence of gigantic races.

Giants in Greek mythology are variously conceived, either as the sons of Gæa, Earth (Hesiod), or as a wild race of aborigines of enormous stature and proportionate strength (Homer). But neither poet refers to that tremendous conflict between the giants and the gods which, though subsequent to the overthrow of the Titans by Zeus, was often confounded with it. Their mother Earth had made them proof against all weapons of the gods, and their final defeat was due to the prowess of a mortal, Heracles. They were struck down and buried under islands and mountains, especially volcanoes. The Enceladus and Typhoeus are associated with Etna. In the colossal sculptures of the altar at Pergamum, in Asia Minor, the greatest representation of the *Gigantomachia* in ancient times, the giants appear in various shapes, some human, some monstrous, snake-footed and winged.

The tradition about the Cyclops shows similarly diverse forms. The earliest legend makes them three in number, sons of Heaven and Earth, belonging to the race of the Titans, and yet helpers of Zeus in his struggle against their family. Each of them had one round eye in the centre of his forehead, and this element appears to be constant in the changing phases of the myth. In the *Odyssey*, however, they are gigantic and lawless shepherds living in Sicily, whose fertile soil produced for them of itself the fruits of the field. They were cannibals as well, and scoffers at Zeus. Polyphemus is described as the strongest among them, and loses his single eye in the encounter with Odysseus. Later they become the assistants of Vulcan at his forge under Etna, or on the Liparian Islands, and tradition ascribed to them the work, equally suitable to their great strength, of building the massive walls of Argos, Tiryns, and Mycenæ.

Consult: Taruffi, *Della macrosomia* (Milan, 1879); Bollinger, *Ueber Zwerg- und Riesenwuchs* (Berlin, 1884); Weinhold, *Die Riesen des germanischen Mythos* (Vienna, 1858); Meyer, *Die Giganten und Titanen in der antiken Sage und Kunst* (Berlin, 1887). See further bibliography in the *Index Catalogue of the Surgeon-General's Library* (Washington), under "Dwarfs and Giants"; Tylor, *Early History of Mankind* (London, 1878); id., *Primitive Culture* (ib., 1891).

GIANTS, BATTLE OF THE. A term used of the Battle of Melegnano (Marignano), fought on September 13-14, 1515, between the allied French and Venetian armies and the Swiss allies of the Duke of Milan, in which the latter were defeated. The name originated with Trivulzio, who said that the eighteen battles which he witnessed were as child's play compared with this combat of the giants.

GIANT'S CAUSEWAY. A promontory on the coast of Antrim in the north of Ireland. A great outpouring of basalt took place here in the Tertiary period, and the edge of the intruded rock-masses was subsequently dissected by erosion, leaving a line of perpendicular cliffs, some of which are 500 feet high. Upon cooling the basalt assumed a columnar structure, to which is due the characteristic appearance of the Causeway. The close-fitting columns have geometrical outlines, usually hexagonal, and are divided into sections of equal length that articulate by means of convex and concave joints. The diameter of the columns ranges from 20 to 30 inches. The Causeway is divided into three portions, the Little Causeway, the Middle Causeway, and the Grand Causeway. The last has a width of from 60 to 120 feet, and extends out to sea for about 500 feet, forming a natural platform, which can be traversed on foot. Many of the neighboring cliffs exhibit the same columnar structure. One group of columns, from its peculiar arrangement, has been named the 'Saint's Organ.' There are many other interesting and picturesque localities in the vicinity, including the Amphitheatre, surrounded by cliffs 350 feet high, Chimney Point, a lofty mass of rocks, and Pleaskin Head. The castles of Dunseverick and Dunluce, now in ruins, are perched on the top of insulated crags.

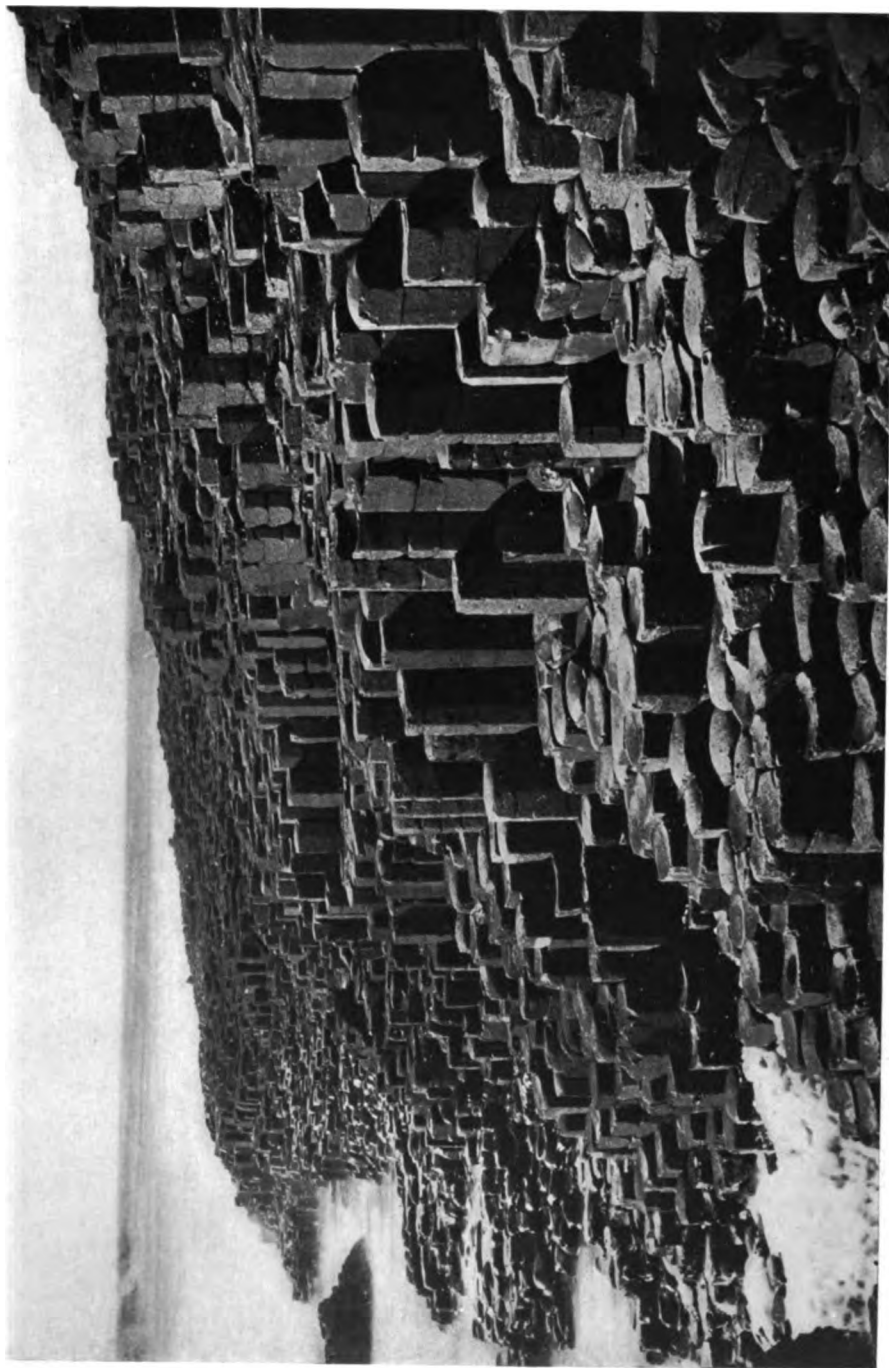
GIANT'S DANCE. An old name (*Chorea gigantum*) for Stonehenge, suggested by a legend concerning that place, which was later superseded by a second tale, related by Geoffrey of Monmouth, causing the old name to fall into comparative disuse.

GIANTS' KETTLES. A popular name for deep cavities or pot-holes occurring in surface rocks. They are common in the glaciated regions of North America and Europe, especially on the coast of Norway, and are formed at the present time beneath the glaciers of the Alps. During the summer months the melting ice gives rise to glacial streams that run down the surface and escape into the crevasses. The erosive powers of the moving waters, carrying sand and stones, are directed by the ice-passages against the rocky floor, into which deep cavities are worn. The occurrence of giants' kettles in regions remote from glaciers is doubtless to be explained by a similar process of erosion operating during the Glacial period.

GIANTS OF GUILDHALL. See GOG AND MAGOG.

GIAOUR, jour. A Turkish word, corrupted from the Arabic *kafir* ('unbeliever'), and applied by the Turks to all who reject Mohammedanism, especially to European Christians. Though at first used exclusively as a term of reproach, its signification has been since modified, and now it is frequently employed merely as a distinctive epithet. Sultan Mahmud II. forbade his subjects to apply the term Giaour to any European.

GIAOUR, THE. A narrative poem by Lord Byron, published in May, 1813. Originally only 400 lines in length, it was enlarged the same year to 1400. It is a fragment of a Turkish tale of a slave, Leila, who was thrown into the sea. Her murder was avenged by her lover, a young Venetian, the Giaour of the title. It contains the well-known lines on Greece, beginning: "He who hath bent him o'er the dead."



THE GIANT'S CAUSEWAY
COUNTY ANTRIM, IRELAND

GIARRE, jár'rá. A rapidly growing city in Sicily, on the lower slopes of Mount Etna, three-quarters of a mile west of its port, Riposto, and 18 miles north of Catania (Map: Italy, K 10). The commercial importance of Giarre is due to its exquisite wines. Population of commune, in 1881, 20,751; in 1901, 26,000.

GIAVENO, já-vá'nò. A city in North Italy, on the left bank of the Sangone, 20 miles west of Turin (Map: Italy, B 2). It markets fruit, wine, potatoes, mushrooms, chestnuts, wood, and coal, and has cotton and jute factories. Population of commune, in 1881, 10,117; in 1901, 10,795.

GIB, gíb, ADAM (1714-88). A Scotch 'Anti-burgher' leader. He was born at Castletown, Perthshire, April 7, 1714. He entered the University of Edinburgh, and while still an undergraduate cast his lot with Ebenezer Erskine (q.v.) and others of the Secession Church. (See PRESBYTERIANISM.) He was licensed to preach in 1740, and the following year was ordained minister of the large Secession congregation of Bristo Street, Edinburgh, where he soon attained a position of prominence. In 1742 he caused some stir by the publication of an invective entitled *A Warning Against Countenancing the Ministrations of George Whitefield*; and in 1745 he was almost the only minister of Edinburgh who continued to preach against rebellion, while the troops of Charles Edward were in occupation of the town. When the dispute concerning the burgher's oath broke out in 1747 (see BURGHER AND ANTI-BURGHER), Gib became a leader of the minority in the 'Anti-burgher' synod. It was chiefly due to his influence that it was agreed by this ecclesiastical body to summon to the bar their 'Burgher' brethren, and finally to depose and excommunicate them for contumacy. From 1753 (when, after protracted litigation, he was compelled to leave the Bristo Street Church) till within a short period of his death, he preached regularly in Nicolson Street Church, which is said to have been filled every Sunday with an audience of 2000 persons. He died in Edinburgh, June 18, 1788. Among his works were: *The Present Truth, a Display of the Secession Testimony* (1774); and *Sacred Contemplations* (1786).

GIBARA, há-bá'rá. An important seaport town of Cuba, situated on the northern coast of the Province of Santiago de Cuba; about 25 miles north by east of Holguín, with which it is connected by rail (Map: Cuba, J 5). It has a fine harbor, protected by a fort at the entrance, and carries on a large trade in fruit, especially bananas, and corn. The vicinity produces also tobacco, sugar, and coffee, and is engaged to some extent in stock-raising. Timber is abundant in this region. The town has military and civil hospitals. Population, in 1899, 6841.

GIBBES, gíbz, ROBERT WILSON (1809-66). An American historian and scientist, born in Charleston, S. C. He graduated in 1827 at South Carolina College (Columbia), and in 1830 at the Medical College of South Carolina (Charleston), and from 1827 to 1835 was assistant professor of chemistry, geology, and mineralogy in the former institution. In 1852-60 he edited the *Weekly Banner* and the *Daily South Carolinian*, and twice he held office as Mayor of Columbia. During the Civil War he was surgeon-general of

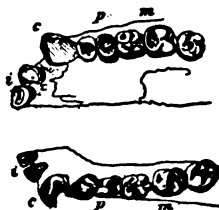
South Carolina. At the burning of Columbia, in 1865, he lost valuable collections of minerals and fossils. In addition to many medical articles in various periodicals, of which that on "Typhoid Pneumonia" in the *American Journal of the Medical Sciences* (1842) may rank as most important, he published a *Documentary History of the American Revolution, Consisting of Letters and Papers Relating to the Contest for Liberty, Chiefly in South Carolina* (3 vols., 1853).

GIB'BET. A highwayman in Farquhar's *Beaus' Stratagem*, who claims that he is the best-behaved man in his profession.

GIBBIE, gíb'bl, GOOSE. A half-witted boy, a servant of Lady Bellenden, in Scott's *Old Mortality*.

GIBBON, gíb'bón (Fr., of unknown origin). An East Indian anthropoid ape of the subfamily Hylobatinae, the lower of the two divisions of the Simiidae, the other being the Simiinae, including the gorillas, orangs, and chimpanzees. The gibbons are of a smaller size and more slender form than the simians, and their arms are so long as almost to reach the ground when the animal stands in an erect posture; there are also naked callosities on the buttocks. The head is well formed, while the lower jaw is remarkable for the great development of the chin. The canine teeth are long. The gibbons are inhabitants of forests, their long arms enabling them to swing themselves from bough to bough, which they do to wonderful distances, and with extreme agility. They cannot move with ease or great rapidity on the ground, yet when they make the attempt they walk more uprightly than any other ape, stretching out their arms on each side to balance themselves, with the hands hanging from the wrist. They never creep on all fours; and they sleep at night curled up in a ball. In captivity they display gentleness and a high degree of teachability, and learn to eat all sorts of cooked food, though their natural diet consists mainly of fruit and birds. They have various loud cries, expressive of different emotions.

There are two genera, *Hylobates*, with seven or eight species, and *Siamanga*, containing only one, the *siamang* (q.v.), which differs from the type in having the first and second digits of the hind foot united as far as the second joint. None of the gibbons is of large size. The common, or lar gibbon (*Hylobates lar*), black, with a border of gray hair around the face, is found in some parts of India and in more eastern regions. The white-handed gibbon (*Hylobates albimana*), black, the face bordered with gray, and the four hands white, is a native of Sumatra. The active, or long-armed gibbon (*Hylobates agilis*), found in Sumatra, is particularly remarkable for the power which it displays of flinging itself from one tree to another, clearing at once, it is said, a distance of forty feet. The wow-wow (*Hylobates leuciscus*) is a gibbon found in Java. The hoolock (*Hylobates hoolock*) is a native of the northeastern part of India and the neighbor-



DENTITION OF A GIBBON.

Teeth of upper and lower jaws, left side: l, incisors; c, canines; p, premolars; m, molars.

ing parts of Assam. The fossil genus *Pithecanthropus* (q.v.) had much resemblance to gibbons.

Consult: Hartmann, *Anthropoid Apes* (London and New York, 1886); Haeckel, *Aus Insulinde* (Bonn, 1901). See APE; HOOLLOCK; SIAMANG; and Plate of ANTHROPOID APES.

GIBBON, EDWARD (1737-94). The historian of the Roman Empire, eldest son of Edward Gibbon and Judith Porten. He was born at Putney on the Thames, April 27 (O. S.), 1737. Of his five brothers and one sister none survived infancy. The story of his life Gibbon told in his autobiography, published after his death under the title, *Memoirs of My Life and Writings* (1796). Like most thinkers, his actions are inseparable from his thoughts and the growth of his mind. He spent a sickly childhood in occasional lessons and desultory reading and discussion with his mother's sister, a woman of strong understanding and warm heart, whom he calls 'the mother of my mind,' and to whose kindness he ascribes not only the bringing out of his intellectual faculties, but the preservation of his life, in these critical early years. Though his education was interrupted by illness, he read enormously. From various tutors and schools he passed to Magdalen College, Oxford (1752). Here he spent fourteen idle months, the chief result of which was that in his incursions into controversial theology he became a convert to the Catholic Church, and found himself shut out from Oxford. His father then placed him under the care of David Mallet, poet and deist, by whose philosophy Gibbon was 'rather scandalized than reclaimed.' He was then sent to Lausanne, in Switzerland, to board in the house of M. Pavilliard, a Calvinist minister, who judiciously suggested books and arguments to the young Gibbon, and had the satisfaction of seeing him reconverted to Protestantism in the course of eighteen months (1754). Subsequently his mature meditations led him away from all religions. With M. Pavilliard, whom he greatly respected, he lived for nearly five years. It was here that he began and carried out those private studies which, aided by his enormous memory, made him a master of erudition without a superior, and with hardly an equal. Here, also, he fell in love with Susanne Curchod, the beautiful and accomplished daughter of a humble minister at Crassy, who afterwards became Madame Necker, the mother of Madame de Staël. Gibbon's father disapproved of this 'strange alliance,' and Gibbon yielded to his fate.

Returning to England in 1758, he continued his studies with some interruptions. At the request of his father he finished a little work in French, begun at Lausanne, and published it under the title, *Essai sur l'étude de la littérature* (1761). In 1759 he became a captain in the Hampshire militia, and afterwards major and colonel. The militia being disbanded, he revisited the Continent, crossing the Alps and going on to Rome, where first came to him the thought of his great work. His plan, originally circumscribed to the decay of the city, grew, by years of reading and reflection and delay, to embrace the Empire. On the death of his father (1770), Gibbon came into possession of a comfortable fortune, settled in London (1772), and at once began writing the *Decline and Fall of the Roman Empire*. In 1774 he joined the famous

Literary Club of Dr. Johnson, and entered Parliament, where he sat 'a mute' for eight years. In 1776 the first volume of the *History* was published, and its success was immediate. Indeed, the reputation of the author was established before the religious world had time to consider and attack the famous fifteenth and sixteenth chapters, in which, while admitting, or, at least, not denying, the "convincing evidence of the doctrine itself," and "the ruling providence of its great Author," Gibbon proceeds to account for the rapid growth of the early Christian Church by 'secondary,' or human causes. He proceeded with the history, publishing two more volumes in 1781. Two years later he returned to Lausanne, where the great work was completed. The last three volumes were published in 1788. In 1793 he returned to England to visit his friend Lord Sheffield, whose wife had just died. While in London Gibbon died, January 16, 1794, and was buried among the Sheffield's in the church at Fletching in Sussex. Under the direction of the Royal Historical Society, the centenary of his death was commemorated in London, November, 1894.

It is not easy to characterize, in a few or in many phrases, a man of so gigantic and cultivated an intellect. The *Decline and Fall* is one of the greatest achievements of human thought and erudition. It is virtually a history of the civilized world for thirteen centuries, during which paganism was breaking down and Christianity was taking its place. The new facts which have come to light since Gibbon's time have shown that he was mistaken on many points; but the truth of his picture in the main has never been successfully impeached. The work also possesses style. No one to-day would imitate, if he could, the balanced structure of Gibbon's sentences. But in Gibbon, as in the Elizabethan writers, the charm lies precisely in this stately march of phrase and sentence. Byron rightly called Gibbon 'the lord of irony.' Of this characteristic of his genius, which gives piquancy to his style, the historian himself was aware; and he claimed to have learned it from Pascal, whose *Provincial Letters* he read almost every year. After all, Gibbon is at his best where he is most himself, as in the dignity and measured melancholy of his autobiography.

Lord Sheffield published Gibbon's *Miscellaneous Works* (2 vols., 1796; 5 vols., 1814). The autobiography contained therein was pieced together from six different manuscripts, with omissions and some additions. These six manuscripts have been published by a grandson of the elder Lord Sheffield (London, 1896). Excellent editions of the *Memoirs* have also been edited by Emerson (Boston, 1898), and by Hill (London, 1900). All editions of the *Decline and Fall* have been superseded by that of Bury (7 vols., London, 1896-1900). Consult also *The Letters of Gibbon*, edited by Prothero (London, 1896).

GIBBON, JOHN (1827-96). An American soldier. He was born in Holmesburg, Pa.; graduated at West Point in 1847, served in the Mexican War, at the City of Mexico and Toluca, in 1847-48, and was assistant instructor of artillery at West Point from 1854 to 1857, and quartermaster there from 1856 to 1859. During the Civil War he was chief of artillery in General McDowell's division from October, 1861, to May,

1862; was promoted from the rank of captain in the Regular Army to that of brigadier-general of volunteers on May 2, 1862; participated in the second battle of Bull Run and in the battles of South Mountain and Antietam; commanded a division in the Army of the Potomac during the Rappahannock campaign, from November, 1862, to June, 1863, being wounded at Fredericksburg on December 13, 1862; commanded the Second Army Corps in the battle of Gettysburg, where he was seriously wounded, and subsequently served for part of the time as commander of the Twenty-fourth Corps, in the final campaign of General Grant, which ended with the surrender of General Lee at Appomattox on April 9, 1865. On June 7, 1864, he became major-general of volunteers, and on March 13, 1865, was brevetted brigadier-general and major-general in the Regular Army. Mustered out of the volunteer service in January, 1866, he reentered the Regular Army as colonel in July, commanded successively several Western posts, was wounded in the engagement of Big Hole Pass, Mont., with the Nez Percés Indians on August 9, 1877, and commanded successively the departments of Dakota, of the Platte, of the Columbia, and of California. On July 10, 1885, he was promoted to the regular rank of brigadier-general, and in 1891 he was retired from active service. Besides a number of magazine articles, he published *The Artillerist's Manual* (1859).

GIBBONS, gib'bonz, ABIGAIL (HOPPER) (1801-93). An American philanthropist, daughter of Isaac T. Hopper (q.v.). She was born in Philadelphia, taught school there and in New York, and in 1833 married James Sloan Gibbons. She greatly assisted her father in the formation of the Women's Prison Association and of the Isaac T. Hopper Home for discharged prisoners. During the Civil War she rendered valuable service in the Federal camps and hospitals. Both she and her husband were widely known as abolitionists, and in the draft riots of July, 1863, their house in New York was one of the first to be sacked. Consult her *Life*, by her daughter, S. H. Emerson (New York, 1897).

GIBBONS, CHARLES (1814-85). An American lawyer, born in Wilmington, Del. After legal study in Philadelphia in the office of Charles Chauncey, he was admitted to the bar in 1838, and for a number of years was a member of the State Senate, of which he served as president in 1847. He was a founder of the Union League, whose constitution he formulated, was chairman of the first Republican State Committee, and during the Civil War represented the United States Government on a special commission for the argument of prize cases in the Federal courts of Philadelphia.

GIBBONS, GRINLING (1648-1721). An English sculptor and wood-carver. He was born at Rotterdam April 4, 1648, and was of Dutch extraction, as is proved by his letters. He attracted the attention of Evelyn (q.v.), the diarist, who introduced him to Charles II. He was master carver in wood to the Crown from Charles II. to George I. His first important group in wood was a "Crucifixion," after Tintoretto's famous picture, which was followed by his "Stoning of Saint Stephen," for the King. Gibbons was much employed by Sir Christopher Wren (q.v.) in his churches, for whom he carved the choir

stalls of Saint Paul, and the woodwork of Trinity College, Cambridge. He executed many carvings for the King in the palaces of Windsor, Whitehall, and Kensington, and his work was found in nearly all the mansions of the nobility built during this period; particularly important is the carving at Chatsworth, made for the Duke of Devonshire. He also essayed sculpture in bronze and marble, but not with the same success, as is shown by his marble statues of Charles II. in the Royal Exchange and Chelsea Hospital, and by the bronze statue of James II. at Whitehall. He employed a large number of assistants, and his work is particularly famous for the splendid groups of flowers, fruit, game, etc., in life size, and very true to nature.

GIBBONS, JAMES (1834-). An American Roman Catholic prelate and cardinal. He was born in Baltimore July 23, 1834, and received his early education in Ireland, the former home of his family, to which he was taken in infancy. Returning to Maryland at the age of seventeen, he pursued his studies for the priesthood at Saint Charles's College and Saint Mary's Seminary. He was ordained in 1861, and after a few months of service at Saint Patrick's, Baltimore, was placed in charge of Saint Bridget's Church, Canton, just outside the city. Archbishop Spaulding soon discerned his gifts, and brought him to the cathedral as secretary, and soon as chancellor. In 1868 he was made Vicar Apostolic of North Carolina, and to fulfill the duties of the office he was consecrated bishop. His successful administration of this difficult work earned him promotion in 1872 to the See of Richmond, Va., and his five years there were also marked by notable development of the Church's activity in many directions. In 1877 he was appointed coadjutor with right of succession to Archbishop Bailey of Baltimore, then in failing health, and later in the same year succeeded to the dignity of Primate of the United States, which is annexed to the See of Baltimore as the earliest in foundation. In right of this office he presided over the important deliberations of the Third Plenary Council of Baltimore in 1884, whose successful issue was largely due to him. In recognition of all these services, as well as of the growing importance of the American branch of the Church, he was created a cardinal by Leo XIII. in 1886; but his elevation made no difference in the simple, unostentatious kindness which had long endeared him to all who knew him, without as well as within his own communion. Because of his advanced age, at his own request, Bishop Curtis, formerly of Wilmington, Del., was appointed to assist him in 1896. His best-known work is *The Faith of Our Fathers* (1871), an admirable popular exposition of the Roman Catholic doctrines; others are: *Our Christian Heritage* (1889) and *The Ambassador of Christ* (1896).

GIBBONS, JAMES SLOAN (1810-92). An American author and philanthropist, born in Wilmington, Del. From 1835 he was active in New York City as a banker and a writer on financial subjects. He became the friend of Wendell Phillips, William Lloyd Garrison, and other notable abolitionists, and rendered much aid to their cause. In 1863 his house in New York City was sacked on account of its illumination in honor of the Emancipation Proclamation.

In 1862 he published in the New York *Evening Post* his famous war song, "We are coming, Father Abraham, three hundred thousand strong." He also began the movement toward the preservation of forests in the United States. He wrote *The Banks of New York* (1838); *The Public Debt of the United States*, (1867); and other works.

GIBBONS, ORLANDO (1583-1625). A celebrated English organist and composer. In his boyhood he served as a chorister at King's College, Cambridge, and in 1604 was appointed organist of the Chapel Royal. He is one of the most important composers in the history and evolution of English music, his services and anthems still being regularly sung in all the cathedrals and important churches of Great Britain. His compositions were the earliest engraved musical works in England. His madrigals, "Dainty Sweet Bird," and "The Silver Swan," are among the best of their kind, and have always been popular; while the anthems, "Hosannah to the Son of David," "Almighty and Everlasting God," and "O Clap Your Hands Together," are reckoned masterpieces of scientific writing in the fugue form, combined with exquisite melody. He died of smallpox, caught while taking part in the marriage services of Charles I., for which ceremony he had composed the music. His two brothers, **EDWARD** (c.1570-c.1650), organist of Bristol Cathedral, and **ELLIS** (?-c.1650), organist of Salisbury Cathedral, were also musicians of wide repute; and his son, **CHRISTOPHER GIBBONS** (1615-76), was appointed organist to the King (Charles II.) and also of Westminster Abbey.

GIBBONS, WILLIAM (1781-1845). An American physician. He was born in Westtown, Pa., graduated at the University of Pennsylvania in 1805, and settled in Wilmington, Del., where he practiced as a physician until his death. He devoted much of his time to the study of the natural sciences and to philological studies, and was a promoter of the Delaware Academy of Natural Science and the first president of that institution. He was a zealous member of the Society of Friends, and is remembered as the author of a tract entitled *Truth Vindicated*, in which he explains and vigorously defends the doctrines of the Society.

GIBBOSITY, gib-bôs'î-tî (from *gibbous*, from Lat. *gibbosus*, humped, from *gibbus*, hump). A variety of outline in which there is a convexity. The moon is gibbous between the half and the full moon. Medically the term is used in describing a protuberance of a part of the body; chiefly applied to humpback or other distortions depending on disease of the spinal column. See **POTT'S DISEASE**; **RICKETS**.

GIBBS, gibz, ALFRED (1823-68). An American soldier, born in Sunswick, Long Island. He graduated at West Point in 1846, served as second lieutenant in the Southern campaign under Scott during the Mexican War, and was brevetted first lieutenant and captain. From 1848 to 1856 he was aide-de-camp to Gen. Persifor F. Smith in Mexico, Texas, New Mexico, and California; was wounded in an engagement with the Apache Indians at Cooke's Spring, N. M., on March 8, 1857; and from 1858 to 1860 was employed in the recruiting service. On May 13, 1861, he became

captain. He was captured by a Texan force on July 8, 1861, was paroled, and was not exchanged until August 27, 1862. Subsequently he took an active part in various cavalry operations in Virginia, particularly under Sheridan in the Shenandoah Valley, was promoted to be brigadier-general of volunteers in October, 1864, and commanded a cavalry brigade in Grant's final campaign against Lee. On March 13, 1865, he was brevetted colonel and brigadier-general and major-general in the Regular Army, as well as major-general of volunteers. He was mustered out of the volunteer service on February 1, 1866, and thereafter until his death at Fort Leavenworth, Kan., was on frontier duty at various Western posts.

GIBBS, GEORGE (1766-1833). An American mineralogist, born at Newport, R. I. He made a collection of minerals containing ten thousand specimens purchased in Europe and more than that number collected by himself. This cabinet, the largest and most important in the United States at that time, was sold to Yale for \$20,000, the funds having been raised largely through the instrumentality of Professor Benjamin Silliman (q.v.). Gibbs published scientific articles in the *American Journal of Science* and the *American Mineralogical Journal*, and in 1822 was elected vice-president of the Lyceum of Natural History at New York.

GIBBS, JOSIAH WILLARD (1790-1861). An American philologist. He was born at Salem, Mass.; graduated at Yale in 1809, and was a tutor there from 1811 to 1815. In 1824 he became professor of sacred literature, an appointment which he held until his death. Among his publications are: A translation of Storr's *Essay on the Historical Sense of the New Testament* (1817); a translation of Gesenius's *Hebrew Lexicon of the Old Testament* (1824); and *Philological Studies* (1857). He was a contributor to Prof. William C. Fowler's *English Language in Its Elements and Its Forms* (1850); and to Webster's *Unabridged Dictionary*.

GIBBS, JOSIAH WILLARD (1839-1903). An American physicist, born at New Haven, Conn. He graduated at Yale in 1858, studied also in Paris, Berlin, and Heidelberg, and in 1871 was appointed professor of mathematical physics at Yale. He was elected a member of the National Academy of Sciences, and of the Royal Society of London. His writings include numerous papers on mathematical physics, in particular on thermodynamics, such as "Graphic Methods in the Thermodynamics of Fluids," and "Method of Geometrical Representation of the Thermodynamic Properties by Means of Surfaces" (1873), both published in the *Transactions of the Connecticut Academy of Arts and Sciences*.

GIBBS, WOLCOTT (1822-). A distinguished American chemist. He was born in New York City; graduated at Columbia in 1841, and at the College of Physicians and Surgeons in 1847, and subsequently studied medicine and the physical sciences in Germany. In 1863 he became professor at Harvard, and lectured on science as applied to the useful arts. During the Civil War he was an active member of the Sanitary Commission, and in 1873 went as one of the commissioners to the Vienna Exposition. He is the author of many papers on chemical science in the

American Journal of Science. He was president of the National Academy of Sciences in 1895. Dr. Gibbs carried out a large number of original investigations in physics and chemistry, which have rendered his name famous. His researches on vapor-densities, on the platinum metals, and on the ammonia-cobalt bases were of particular importance.

GIBEAH, gîb'ê-â (Heb., *Gîb'ah*, hill). The name of several places in ancient Palestine, the chief of which was Gibeah of Benjamin, called also Gibeah of Saul. It was north of Jerusalem and south of Rameh, and was the scene of the story of the Levite and his concubine (Judges xix.-xxi.). At various times in the struggles with the Philistines Gibeah became an important strategic point. It was the home of Saul, and probably his birthplace (I. Sam. x. 26). In the days of David two sons and five grandsons of Saul are said to have been executed here in revenge for a slaughter of the Gibeonites by Saul (II. Sam. xxi. 1-9). The narrative of Saul's reign gives no account of such an event. Gibeah of Benjamin has been identified with the modern village of Tuleil or Tell el-Ful, about four miles north of Jerusalem.

GIBEL, gîb'el (Ger., sort of chub, Fr. *gibel*; possibly connected with Ger. *Giebel*, gable, OHG. *gebal*, head, *gibilla*, skull, Gk. κεφαλή, *kephalē*, head), or **PRUSSIAN CARP**. A small carp (*Cyprius gibelio*) without barbels, common in some parts of Continental Europe and in England. It differs from the crucian in having a forked tail, and is an excellent table fish. See **CARP**.

GIBEON, gîb'ê-on (Heb. *Gîb'on*, hilly). An ancient city of Palestine, northwest of Jerusalem, at the time of the conquest by the Israelites, inhabited by the Hivites (Joshua ix. 3, 7). By means of a stratagem the Gibeonites secured a promise of friendship from Joshua. The deceit was afterwards discovered, but the letter of the promise was kept, the Gibeonites being condemned to be 'hewers of wood and drawers of water for the congregation,' and when the five kings of the Amorites attacked Gibeon, Joshua went to its assistance (Joshua ix. 3-x. 7). It was during the battle fought on this occasion that "the sun stood still and the moon stayed, until the people had avenged themselves upon their enemies" (Joshua x. 8-14). Saul almost exterminated the Gibeonites (II. Sam. xxi. 1-5). Gibeon was the scene of a battle between David's forces and those of Ishbosheth (II. Sam. ii. 12-32), and at 'the great stone which is in Gibeon' David's general, Joab, treacherously slew the other general, Amasa (II. Sam. xx. 4-10). The city had its chief importance as the seat of a *bamah*, or high place, called in I. Kings iii. 4 'the great high place.' At the beginning of his reign Solomon sacrificed there a thousand burnt offerings with great ceremony, and Yahweh appeared to him in a dream by night (I. Kings iii. 4-15). Gibeon is identified with the modern village of el-Jib, about five miles northwest of Jerusalem.

GIBRALTAR, jîb-râ'l'târ, *Sp. pron.* hê-brâl-tîl'r. A town and fortress on the rocky promontory of Gibraltar, forming the eastern horn of the Bay of Algeiras, or Gibraltar, on the south coast of Andalusia, Spain, at the eastern end of the Strait of Gibraltar, at the entrance to the

Mediterranean (Map: Spain, C 4). Since 1704 it has been a Crown colony of Great Britain, under the administration of a governor. It stands opposite the Spanish town of Algeiras, six miles distant on the west side of the bay, with which it has steam-ferry communication several times daily. Owing to its important strategical position, it is called the 'Key of the Mediterranean.' The sandy isthmus connecting the promontory with the mainland is neutral territory; it lies so low that from the sea Gibraltar has the appearance of an islet. The Spanish town of La Línea de la Concepción, practically a suburb of Gibraltar, on the mainland, fronts the isthmus and the neutral ground, the Spanish boundary being marked by a double line of sentry-boxes. The population of La Línea in 1901 was 31,862, 10,000 of whom, it was estimated, formed the daily laboring class of Gibraltar. The promontory, or 'Rock of Gibraltar,' composed of gray primary marble, is in the form of an 'enormous lion'; it is nearly three miles long, with an average width of about three-quarters of a mile, and attains an altitude of 1439 feet. Although it has a barren and uninviting aspect, aloes, cacti, palmitas, capers, and asparagus grow in the crevices; and there are grassy, wooded glens in certain parts, where partridges, pigeons, wood-cocks, and fawn-colored Barbary apes are to be found. There are several natural caves in the rock, of which Saint Michael's, with an entrance 1100 feet above the sea, is the largest. The north, east, and south sides of the promontory are so steep and precipitous as to be almost inaccessible; the north and northwest sides are honeycombed by fortified artificial galleries. The town and fine modern harbor on the west are protected by a sea wall with bastions, and by batteries and forts rising from the base to the summit of the rock. Modern guns of the most formidable pattern have replaced the old armaments.

The town, divided by the Alameda Park into two parts, although irregularly laid out, contains several fine public buildings. The houses are built in terraces, and for the most part are of Spanish architecture. There are an Anglican cathedral, four Roman Catholic churches, and hospitals. The water-supply depends on the rainfall, which is stored in a system of huge tanks. The climate is the warmest in Europe, but is healthful, the former unsanitary conditions having been removed by modern methods. The colony is self-supporting, but the garrison is maintained by the British Government. Gibraltar is a free port, and an important coaling station. The shipping of the port exceeds 4,000,000 tons annually, and is mostly in British bottoms. The legal currency is British, but Spanish money is also in circulation. The population, including the garrison of 5349 men, in 1901, was 27,460, consisting mostly of Britons, Spaniards, Jews, and Moors.

Gibraltar (the Phœnician *Alube* and Greek *Calpe*) and Abyla (the Sierra Bullones near Ceuta, Morocco) are the classical 'Pillars of Hercules,' which were crowned by silver columns erected by the Phœnician mariners to mark the limits of navigation. After 711 the rock was named Jebel-al-Tarik (Hill of Tarik, whence its modern name), after the Arab chief Tarik ibn Ziad, who built a fortress on the promontory, part of which still exists. In 1309 Gibraltar was

taken by the Castilians, but was regained by the Moors in 1333, and held until 1462, when it finally passed from their possession. After the sacking of Gibraltar by Barbarossa, the Algerine, in 1540, extensive works were built by command of Charles V. In 1704 it was captured by a combined Dutch and English force under Sir George Rooke and the Prince of Hesse-Darmstadt, fighting for the Archduke Charles of Austria; but it was unscrupulously taken possession of for the Crown of England by the British admiral. The most important event in its subsequent history is the famous siege of three years, seven months, and twelve days, extending from 1779 to 1783, which bristled with exciting incidents. Communications with Spain were closed on June 21, 1779, and a strict blockade was established by the Spanish fleet; the strength of the besieged force at this period was 5382 men, under General Elliott, the Governor. Twice the garrison was almost reduced to starvation, being temporarily relieved in the face of great opposition, on the first occasion by Admiral Rodney, who added 1000 to the defenders, and on the second occasion by Admiral Darby. In July, 1782, the Duc de Crillon took command of the combined naval and land forces of France and Spain employed in the siege, and made preparations for a supreme effort. Additional batteries were constructed on the land side, and ten enormous and presumed invincible floating batteries were constructed by the Chevalier d'Arçon. Covered boats to disembark 40,000 troops were also prepared. The formidable attack commenced on September 8, and continued until the 13th, when, by the expedient of red-hot balls, the British destroyed the floating batteries and repulsed their enemies, of whom over 2000 were killed. The British casualties were 16 killed and 68 wounded. The signing of the preliminaries of peace put an end to the siege in February, 1783. Consult: Drinkwater, *History of the Siege of Gibraltar* (London, 1785; new ed. 1844); Mann, *History of Gibraltar* (London, 1870); Field, *Gibraltar* (New York, 1889).

GIBRALTAR, STRAIT OF (Lat. *Fretum Herculeum*). A narrow passage connecting the Atlantic Ocean with the Mediterranean Sea, and separating Spain from Morocco (Map: Europe, C 5). Its length is about 36 miles, and its width varies from about 9 miles at the western entrance to about 13 miles at the eastern entrance. The depth averages about 900 feet. A continual central current enters from the Atlantic, and tidal currents ebb and flow along the European and African shores. It is supposed that the surplus waters of the Mediterranean are carried off by an under-current in the strait, as well as by evaporation.

GIBRALTAR OF AMERICA. A frequent name for Quebec, because of its position and strong fortifications.

GIBSON, gib'son, CHARLES DANA (1867—). An American illustrator. He was born at Roxbury, Mass., September 14, 1867. The first eight years of his life were spent in Boston. Later his home was in Flushing, Long Island. He was a student at the Art Students' League, New York. In 1886 he made his debut as an artist for the periodicals. In 1889 he went to Paris, and was enrolled at Julien's studio. Returning to New York, he was active as an illustrator. In 1893-

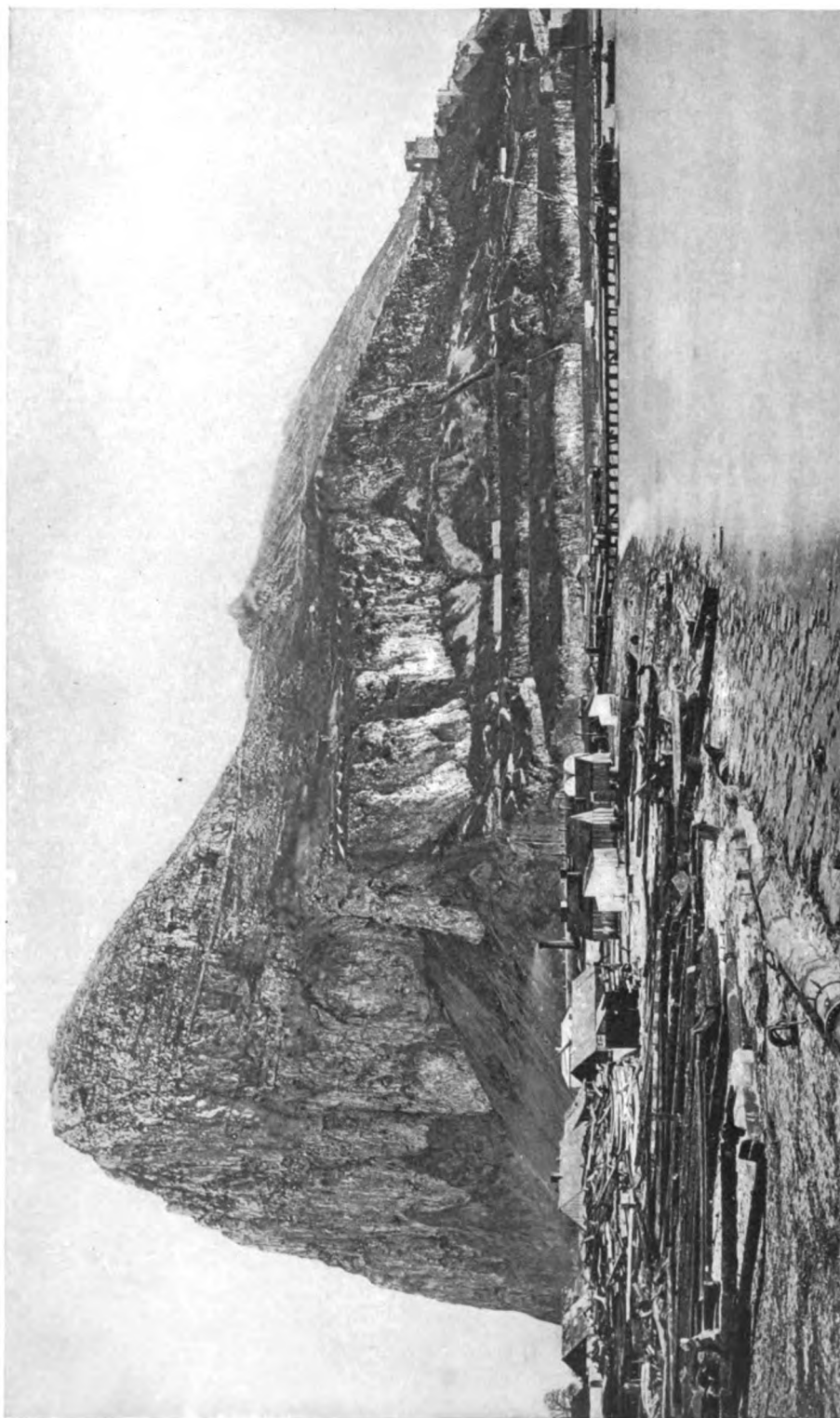
94 he was again in Paris; in 1895-96, in London; in 1898, in Munich.

His subjects are taken from the boulevards, byways, theatres, clubs, law courts, music halls, parks, and crowds in stations. His most popular works are society cartoons. He is a skillful draughtsman, making his lines characterize the person or object with the greatest simplicity. Gibson is one of the most successful artists in New York City. His published works include: *London, as Seen by C. D. Gibson* (1895-96); *Pictures of People* (1896); *People of Dickens* (1897); *Sketches and Cartoons* (1898); *The Education of Mr. Pipp* (1899); *Americans* (1900); *A Widow and Her Friends* (1901); *The Social Ladder* (1902). He created the type of woman known as the 'Gibson girl.'

GIBSON, EDMUND (1669-1748), Bishop of London, and an authority upon canon law. He was born in 1669; entered Queen's College, Oxford, in 1686; and in 1692 published an edition of the *Saxon Chronicle*, with a Latin translation, indices, and notes. This was followed in 1693 by an annotated edition of the *De Institutione Oratoria* of Quintilian, and in 1695 by a translation of Camden's *Britannia*, 'with additions and improvements,' in the preparation of which he had the assistance of several other scholars. The year preceding he had taken holy orders, and became chaplain and librarian to Thomas Tenison, Archbishop of Canterbury. In 1703 he became rector of Lambeth, and in 1710 Archdeacon of Surrey. In the discussions which arose in the reigns of William and Anne relative to the rights and privileges of the Convocation, Gibson took a very active part, and in a series of pamphlets warmly advocated the right of the Archbishop to continue or prorogue that assembly. The controversy suggested to him the idea of those researches which resulted in the *Codex Juris Ecclesiæ Anglicanæ*. In 1716 Gibson was consecrated Bishop of Lincoln, whence he was, in 1723, translated to London, where for twenty-five years he exercised an immense influence, being the authority chiefly consulted by the Court on all ecclesiastical affairs. Among the literary efforts of his later years, the principal were a series of *Pastoral Letters*, and the *Preservative Against Popery* (1738), a compilation of numerous controversial writings of eminent Church of England divines, dating chiefly from the period of James II. He died at Bath, September 6, 1748.

GIBSON, JOHN (1790-1866). An English sculptor. He was born at Gyffin, near Conway, North Wales, and at an early age was apprenticed to a cabinet-maker in Liverpool. When sixteen years old he was employed in the marble-works of Francis, at Liverpool, where his talents gained him the patronage of William Roscoe, who not only became his friend, but also secured him pecuniary aid. In 1817 he made his way to London, and in the same year he went to Rome, bearing a letter of introduction from Lord Brougham to Canova. He entered the atelier of Canova, and remained in Rome twenty-seven years, executing in that city most of his important works. He occasionally returned to England to superintend the placing of his statues, and on these occasions was received with enthusiasm, and every attention paid him.

In 1819 he executed his first commission, a



ROCK OF GIBRALTAR

group of "Mars and Cupid," for the Duke of Devonshire, now at Chatsworth. Under the influence of Canova and Thorwaldsen, his work became thoroughly classic, and he excelled in portraying ideal Greek subjects of youthful beauty. Among the most famous of these are the "Psyche Borne by Zephyrs" (1821) and "Hylos Surprised by Nymphs" (1826), both in the National Gallery, London; and especially his statue of "Venus with the Turtle," one of his latest works, which he himself considered his best. In this statue he made use of the polychromy of the Greeks, as he conceived it. He was so thoroughly wedded to Greek art that when commissioned to make a portrait statue of Queen Victoria he would do it in no other wise than represent her in classical draperies and with sandals. In the Palace of Westminster he carved the group in which the Queen is represented leading the allegorical figures of "Clemency" and "Justice." The only religious subject he portrayed was "Christ Blessing the Little Children." His best work in the round was the "Hunter and Dog." His classical tendencies interfered with his success in portrait statues. Among the best known of these are the colossal statue of Huskisson (1844), in Liverpool, and two other statues of the same statesman; Sir Robert Peel, in Westminster Abbey; and George Stephenson, in Liverpool. Gibson was a man of kindly life and character, and notoriously absent-minded. His only pupil and most intimate friend was Harriet Hosmer, the American sculptress. He died in Rome, January 27, 1866. Consult his *Life*, by Lady Eastlake (London, 1869), which also contains his autobiography.

GIBSON, JOHN MONRO (1838—). A Scottish clergyman of the Presbyterian Church, born at Whithorn, Wigtownshire. He went to Canada in 1855; graduated in 1862 at Toronto University, and in 1864 at Knox College (theological), Toronto; and in 1864-74 was pastor of the Erskine Church, Montreal. From 1868 to 1874 he was also lecturer in Hebrew and Greek exegesis at Montreal Theological College. He was pastor of the Second Presbyterian Church, Chicago, in 1874-80, and in the latter year became pastor of the Saint John's Wood Presbyterian Church, London, England. In 1891 he was elected moderator of the Presbyterian Council of Free Churches. His publications include: *The Ages Before Moses* (1879); *The Foundations* (1880); *The Gospel of Matthew* (1890), in the "Expositor's Bible Series"; *The Unity and Symmetry of the Bible* (1896); *From Fact to Faith* (1898); and *The Glory of Life* (1900).

GIBSON, JOHN MORISON (1842—). A Canadian official. He was born near Toronto, and was educated in Hamilton and at the Toronto University, where he took a law course. In 1889 he was elected Provincial Secretary, and in 1890 he was appointed a Queen's counsel. He became widely known because of his active interest in educational and military matters, was appointed lieutenant-colonel of volunteers, and did much to increase the efficiency of his regiment.

GIBSON, RANDALL LEE (1830-93). An American soldier and legislator. He was born at Spring Hill, Ky.; graduated at Yale in 1853, and afterwards studied law at the University of Louisiana (now Tulane University). After having been admitted to the bar, he went to

Europe, where he studied at Berlin and Madrid, and was attached to the American Legation at the latter place. In 1856 he returned to Louisiana, where he was engaged in sugar-planting until the outbreak of the Civil War. Enlisting at first as a private in the Louisiana volunteers, he was rapidly promoted, was appointed colonel of the Thirteenth Louisiana Infantry, and commanded a brigade at Shiloh, where he distinguished himself by leading in person four unsuccessful charges on the famous 'Hornets' Nest.' He fought in the battles of Perryville, Murfreesboro, and Chickamauga, and was promoted to the rank of brigadier, and finally major-general. He participated in the battles during Johnston's retreat from Dalton to Atlanta, at the battles of Jonesboro and Nashville, and in the Mobile campaign. After the war he began the practice of law in New Orleans. He was elected to Congress in 1872, but was not seated. On his second election, in 1874, however, he was allowed to take his seat, and remained in the House of Representatives until 1882, after which, until his death, he was a member of the United States Senate.

GIBSON, THOMAS MILNER (1806-84). An English statesman. The only son of Major Milner-Gibson, he was born at Port of Spain, Trinidad, West Indies, September 3, 1806. He was first educated at Dr. Cogan's Unitarian School, Walthamstow, where Benjamin Disraeli was his classmate. He entered at the Charterhouse School in 1819, and in 1830 proceeded B.A. at Trinity College, Cambridge. In 1837 he entered Parliament as Conservative member for Ipswich, but became a Liberal, and resigned two years later. He assumed the surname of Milner-Gibson by royal license in 1839. After unsuccessful attempts to reënter Parliament, he was returned for Manchester in 1841. In 1846 Lord John Russell made him Privy Councillor and vice-president of the Board of Trade. As president of the Association for the Repeal of the Taxes on Knowledge, his crusade against the excise on paper, the advertisement duty, and the newspaper stamp duty, resulted in the repeal of these taxes in 1861, and Milner-Gibson was the recipient of a public testimonial. At the outbreak of the Crimean War he identified himself with the 'Peace Party' of Cobden and Bright. His views were distasteful to his constituency, and he was unseated in 1857; but the same year was returned for Ashton-under-Lyne, which he represented till 1868, when his defeat at the general election led to his retirement from political life with a pension of £2000. From 1859 to 1866 he was president of the Poor-Law Board, and president of the Board of Trade with Cabinet rank. He was a justice of the peace and deputy lieutenant for Suffolk, and after his retirement was one of the most diligent of the Public Works Loan Commissioners. He was an enthusiastic yachtsman, senior member of the Royal Yacht Squadron, and an elder brother of the Trinity House. He died on board his yacht at Algiers, February 25, 1884.

GIBSON, WILLIAM (1788-1868). An American surgeon, born in Baltimore, Md. He graduated at Princeton in 1806, and at the University of Edinburgh in 1809, and fought with the Allies at Waterloo in 1815. From 1819 to 1855 he was professor of surgery in the University of Penn-

sylvania. He was the friend of Lord Byron, and of many noteworthy English and European surgeons. He published *Principles and Practice of Surgery* (2 vols., 1824), once widely used, and *Rambles in Europe* (1839). Consult Gross, *Sketches of Contemporaries*.

GIBSON, WILLIAM HAMILTON (1850-96). An American painter, illustrator, and author. He was born at Sandy Hook, October 5, 1850. He studied at the Polytechnic Institute, Brooklyn, and afterwards at Washington, Conn. He began his career as an artist with illustrations of botanical drawings for the *American Agriculturist* and *Hearth and Home*; also for *Harper's Magazine* and the *Art Journal*. Gibson's drawings are very correct and minute in detail, and he used a few tints exquisitely. His subjects include the interpretations of woodland beauties, and of flowers and insects. His art is pervaded with the accuracy of the lover of scientific fact, and he was a successful lecturer on botany. He was author and illustrator of the following publications: *Camp Life in the Woods* (1876); *Highways and Byways* (1883). He made the illustrations for E. P. Roe's *Nature's Serial Story*. He died at Washington, Conn., July 10, 1896.

GICHTEL, gik'tel, JOHANN GEORG (1638-1710). A German theosophist. He was born in Regensburg, and was a lawyer by profession. In 1664 he came under the influence of the Theosophists, and thenceforth devoted himself entirely to their doctrines. His teachings brought him frequently into conflict with the authorities. Banished from his native town, he betook himself to Holland, where the same experience was repeated. After 1668 he lived at Amsterdam. He founded an order whose members called themselves 'Angelic Brethren,' because they renounced marriage. He made the first collected edition of the writings of Jakob Boehme (Amsterdam, 1682). His own writings appeared in a collected edition at Leyden in 1722, and his biography, in connection with Boehme's, was written by Harless (Leipzig, 1882).

GID (from *giddy*), or **STURDY**. A disease of sheep, caused by the presence of the larva of a tapeworm (*Tænia canurus*) in the brain. Before the life history of this parasite was discovered the larva was known as *Cenurus cerebralis*, which sometimes attains the size of a hazelnut. It floats in a watery fluid inclosed in a membranous sac. Should the larva be eaten by a dog, it becomes a vermiform parasite, and lays eggs which, being voided by the dog, may be picked up by the sheep while grazing, finally to reach the brain by way of the arteries. Rabbits and even sheep may also serve the same office as the dog in the life cycle of the worm. The afflicted sheep staggers when moved, turns stupidly around almost in one spot, usually toward the side upon which the parasite lies, and loses flesh because these conditions interfere with food-prehension. The parasite and its sac may generally be safely removed by placing the sheep, with its feet tied, on a table or bench, searching for the softened portion of the skull, which generally overlies the hydatid, laying back a flap of skin, and introducing the trochar and canula, and when the sac is deep-seated, cautiously withdrawing it with the help of a small syringe. Protected by a leather cap and simple water-dressings, the wound speedily heals. In

preventing the spread of this disease, which is especially common in low, damp pastures, and among sheep from 6 to 20 months old, it is desirable to burn the heads of affected sheep, otherwise they may be eaten by dogs in which the immature tapeworms would develop to the adult egg-laying form.

GIDDINESS. See **VERTIGO**.

GIDDINGS, gid'dingz, FRANKLIN HENRY (1855—). An American sociologist and economist, born at Sherman, Conn. He graduated at Union College (1877), and engaged in newspaper work, writing on politics and economics for the *Springfield Republican* and the *Springfield Daily Union*. In 1888 he was appointed lecturer in political science at Bryn Mawr, where he was subsequently advanced to the chair of political science. In 1894 he was appointed professor of sociology at Columbia University. His principal works are: *The Modern Distributive Process* (1888), in the publication of which he collaborated with Prof. J. B. Clark; *Principles of Sociology* (1896); *Elements of Sociology* (1898); *Democracy and Empire* (1900); and *Inductive Sociology* (1901). Although the works of Professor Giddings have contributed much to the science of sociology, his position is primarily that of a systematizer of knowledge already demonstrated. The working principle by which he seeks to explain the fundamental sociological phenomena is psychical in its nature — 'consciousness of kind' in his earlier works; 'like response to like stimuli' in his latest volume. In this he differs radically from the school of contemporary writers, who seek to explain sociological facts in terms of the environment. See **SOCIOLOGY**.

GIDDINGS, JOSHUA REED (1795-1864). An eminent American legislator, prominent as a 'Constitutional' Abolitionist in the anti-slavery struggle. He was born at Tioga Point, Pa., October 6, 1795. His early life was spent in Canandaigua, N. Y., until his parents removed to Ashtabula County, Ohio, where he afterwards resided. He enlisted as a soldier in the War of 1812, and served for a few months in the protection of the Western Reserve against the Indians; then taught school, studied law, and in 1821 began professional practice at Jefferson. In 1826 he was sent to the State Legislature, and in 1838 to Congress. The slavery agitation had already begun, and Giddings became a forceful advocate of the abolition of slavery in the District of Columbia and the national Territories. He supported the efforts of John Quincy Adams to maintain the right of petition, and in fact seized upon every opportunity to develop a public sentiment hostile to slavery. On February 9, 1841, he delivered a powerful speech upon the Indian War in Florida, insisting that it was waged in the interest of slavery. While the excitement caused by the Creole Case (q.v.) was at its height, he introduced in the House of Representatives a series of resolutions declaring that the slaves, having simply asserted their inalienable right to liberty, were guilty of no crime, and that as soon as they left the jurisdiction of Virginia they became free. The resolutions created a tumultuous excitement, and Giddings was censured by vote of the House for presenting them. He thereupon resigned his seat, but was reelected by a very large majority. He was kept at his post by successive reflections

until 1859, thus completing a continuous service of twenty years. Until 1848 he was a member of the Whig Party, supporting its principal measures, but maintaining his independence in all matters relating to slavery. He did much to develop those views with regard to the relation of slavery to the National Government which afterwards became the basis of the Republican Party. He took a prominent part in the struggle to prevent the extension of slavery to the territory wrested from Mexico by the war of 1846-47, and in resisting the adoption of the Compromise of 1850, especially the reenactment of the Fugitive Slave Law (q.v.). He was also conspicuous in the debates which preceded the repeal of the Missouri Compromise in 1854, and in the great struggle by which Kansas was made a free State. On May 8, 1856, while addressing the House, he suddenly fell to the floor in a state of unconsciousness. He soon revived, but his former strength was never fully restored. On January 17, 1858, he fell again in the same way, and for a time was supposed to be dead. He again rallied, however, but was compelled for a time to leave his post. In 1861 he was appointed Consul-General for the British North American Provinces, with headquarters in Montreal. In 1843 he wrote a series of political essays signed 'Pacificus,' which attracted wide attention. A volume of his speeches was published in 1853. He also wrote: *The Exiles of Florida* (1858), and *The History of the Rebellion: Its Authors and Causes* (1864). Consult: Buel, *Joshua R. Giddings* (Cleveland, 1882); and, more particularly, Julian, *Life of Joshua R. Giddings* (Chicago, 1892).

GIDE, zhéd, CHARLES (1847—). A French political economist, born at Uzès (Gard). From 1874 to 1880 he was professor of jurisprudence at Bordeaux, and in the latter year became professor of political economy at Montpellier. He also was appointed editor of the *Revue d'économie politique*. He became a leader in the movement toward 'Christian Socialism' organized by French Protestants, and in his writings expressed the views of the classical French school of economics. In addition to numerous contributions to reviews, his publications include: *Du droit d'association en matière religieuse* (1872); *Principes d'économie politique* (1884); and *Etude sur l'Act Torrens* (1886).

GIDE, Théophile (1822-90). A French historical and genre painter, born in Paris, where he studied under Delaroche and Cogniet. His scenes from popular life in Italy are very truthful and characteristic, but he treated the historical genre and interiors with equal success. Especially noteworthy are: "Condemnation of Cinq Mars" (1855); "Sully Leaving the Court of Louis XIII." (1863); "Monks at Study" (1866, Alençon Museum); "Pius IX. Visiting a Nunnery" and "Rehearsal of a Mass" (1866, Roubaix Museum); "Louis IX. Surprised at Prayer by his Jester" (1877); "Checkmate" (1884); and "A Painter in the Convent" (1887).

GIDEL, zhédél', CHARLES ANTOINE (1827-1900). A French author, born at Gannat (Allier). He was a professor successively at the Lycée Henri IV., the Lycée Louis le Grand, and the Lycée Condorcet. His most important work is the *Histoire de la littérature française depuis son origine jusqu'à la renaissance* (1874-88).

His *Etude sur Saint-Evremond* (1866) was awarded the *prix d'éloquence* by the Academy.

GIDEON, gid'ə-on (Heb. *Gid'on*; perhaps connected with *gada'*, to fell). A Hebrew warrior, also called Jerubbaal and once (II. Sam. xi. 21) Jerubbesheth. According to the biblical narrative, Gideon delivered the Hebrews from the oppression of the Midianites, and became one of the 'judges' of Israel, and his son Abimelech was made 'king' in Shechem (Judges vi.-ix). The modern critics look upon Gideon as a popular hero, whose story has received embellishments of a more or less distinctly legendary character. Even when stripped of these legendary features, the narrative is still regarded as quite complicated, and, in order to explain it, it is assumed that Gideon and Jerubbaal are two distinct personages. Changes are also made in the text, which is undoubtedly very corrupt. On this assumption Gideon belongs to the western section of Manasseh, Jerubbaal to the eastern; or perhaps to the clan of Gad. The stories and legends regarding these heroes, after being confused in the minds of the people, have been combined by successive narrators and redactors into a single tale. In the case of both heroes, the opponents against whom they contend successfully are Midianites, a term which becomes in the hands of Old Testament writers a general designation for the rude Bedawin hordes which at all times, even to the present day, have rendered life uncertain among the peaceful agricultural population of Palestine and Syria. According to the original Gideon narrative, these Bedouin invaders choose the harvest-time as the most favorable moment of attack, when they are certain of reaping a rich booty. Gideon at Ophrah receives the summons through Yahweh to gather his clansmen in order to resist the expected attack of the nomads. Warriors of Ephraim join with those of Manasseh, and the march is begun to Mount Gilboa, beneath which the Midianites are encamped. Gideon approaches the camp stealthily, and, encouraged by hearing one of the Midianites relating to his fellow a significant dream, returns to the Hebrew camp. With the war cry 'the sword of the Lord and of Gideon' the Hebrews rush upon the Midianites, who are utterly routed, and flee to the distant slopes of Abel Meholah, or, as some critics propose to read, Abel-beth-maacah. They are followed by the victorious Hebrews, who succeed in capturing two of the princes of the Midianites, Oreb and Leeb, and their heads are brought to Gideon. In the original Jerubbaal story the hero, residing at Jazer, is represented as proceeding with ten members of his household at night against the Midianites, and inflicting a slaughter among them. In revenge the Midianites turned against Jerubbaal's brethren, slew them, and went on plundering and killing far to the north. Jerubbaal now gathers three hundred warriors of his clan around him, and after enduring many hardships on the road, finally encounters the Midianites at Karkor. By means of a stratagem he surprises and throws the Midianites into a panic, the result of which is a complete defeat of the marauders. Jerubbaal caught the two kings of Midian, Zebah and Zalmunna, and put them to death. In the legendary amplification of this narrative, Jerubbaal is recognized as king by his people, and since, as a worshiper of Jehovah, it seemed distasteful to later editors that he should

have a name which contained Baal as an element, the name is interpreted and modified as though it indicated 'opposition to Baal' (Judges vi. 32), and in one instance (II Sam. xi. 21) is disguised by substituting *besheth* for it. (See BAAL.) In general, however, the name Gideon is quietly substituted for Jerubbaal. The similarity of the two stories no doubt was one element which led to their confusion in the minds of the people, but the combination is essentially the work of narrators who aimed at reconstructing the past from the point of view of zealous devotees of Jehovah. In the course of the narratives stress is laid on the fact that the oppression of the Midianites is a punishment sent because the people had fallen away from Jehovah, while Gideon is represented as a Jehovah purist, who at the risk of his life destroyed the Baal altars in his town (Judges vi. 25-32). Consult the chapters on Gideon-Jerubbaal in the Hebrew histories of Stade, Kittel, Guthe, Wellhausen, and the commentaries on the Book of Judges by Studer, Bachmann, Moore, and Budde; also Niebuhr, *Studien zur Geschichte des alten Orients*, vol. i. (Berlin, 1894); Budde, *Richter und Samuel* (Giessen, 1890).

GIEBS, gēr, NIKOLAI KARLOVITCH DE (1820-95). A Russian statesman. He served for some years in the Asiatic Department of the Ministry of Foreign Affairs, and was sent as Minister Plenipotentiary to Teheran in 1863, to Bern in 1869, and to Stockholm in 1872. After his marriage into the family of Prince Gortchakoff, the latter made him his adjunct. In 1882 Giers succeeded the Prince as Minister of Foreign Affairs, having meanwhile shown himself an astute diplomat in the negotiations with Great Britain on the Afghan boundary question; and in this position he was noteworthy for wise conservatism and the maintenance of peaceful relations with other European powers.

GIERYMSKI, gēr-m'skē, MAX (1846-74). A Polish genre painter, born at Warsaw. After having fought against Russia during the insurrection of 1863, he studied music at Warsaw until 1865, when he went to Munich, in order to devote himself to painting, and became a pupil successively of Alexander Wagner, Franz Adam, and Schleich. Although his career was short, he produced some very characteristic work, notably "Polish Spinning Room," "A Pistol Duel on Horseback," "Jews at Prayer," "Insurgents in the Woods," "Cossacks on the March," and "Stag Hunt in the Eighteenth Century" (1874, National Gallery, Berlin). He was elected a member of the Berlin Academy in 1872.

GIESEBRECHT, gē'ze-brēkt, FRIEDRICH WILHELM BENJAMIN VON (1814-89). A German historian, born in Berlin. He pursued historical studies at the University of Berlin as a pupil of Leopold von Ranke. In 1857 he was appointed professor of history at Königsberg, and in 1862 accepted a call to Munich. His *Geschichte der deutschen Kaiserzeit* (vol. i., 1855; vol. v., 1888), a monumental undertaking for which the Berlin Academy awarded him the prize established by Friedrich Wilhelm IV. in recognition of distinguished service to German history, is marked in the earlier volumes by much attractiveness of presentation, and throughout by a minute and exacting investigation of sources. He further published several learned essays and *Deutsche Reden* (1871), a collection of addresses pro-

nounced on academic occasions. Consult a memorial oration by Riezler (Munich, 1891).

GIESELER, gē'ze-lēr, JOHANN KARL LUDWIG (1792-1854). One of the greatest of Church historians. He was born March 3, 1792, at Petershagen, near Minden, Westphalia, where his father was a clergyman. He was educated at Halle, and in October, 1813, entered the army as a volunteer during the War of Liberation. In 1818 he was appointed to the directorship of a newly instituted gymnasium at Cleves, and published his *Historisch-kritischer Versuch über die Entstehung und die frühesten Schicksale der schriftlichen Evangelien*. In consequence of this publication he was called, in 1819, as professor of theology, to the University of Bonn, which had been established but shortly before. It was in this place that he began his great work on Church history, of which three volumes appeared during his life, and two more after his death, under the editorship of E. R. Redepenning (Bonn, 1823-52, 3 vols., in 8 parts; 4th ed. of first four parts, 1844-48; 2d ed. of fifth part, 1849; posthumous ed., vols. iv. and v., 1854-55; Eng. trans. revised and corrected by H. B. Smith, New York, 1855-80, 5 vols.). Vol. vi. (1856) contains his *Dogmengeschichte*. In 1831 Gieseler was called to a chair in Göttingen. Besides numerous contributions to periodicals and publications on contemporary questions, he edited Euthymius Zygabenus, *Narratio de Bogomilis* (Göttingen, 1842), as well as Petrus Siculus, *Historia Manichæorum seu Paulicianorum* (Göttingen, 1846). He died at Göttingen, July 8, 1854. For his life by Redepenning, consult vol. v. of his *Kirchengeschichte* (vol. i. of the Eng. trans.).

GIESSBACH (gēs'bāk) FALLS. A picturesque cataract of Switzerland, falling into Lake Brienz (q.v.). It consists of seven cascades, formed by the Giessbach stream during a descent of 980 feet from its source in the Schwarzhorn. The largest cascade has a fall of 190 feet.

GIESSEN, gēs'sen. A town of Hesse, capital of the Province of Upper Hesse, situated at the confluence of the Wieseck and the Lahn, 41 miles by rail north of Frankfurt (Map: Germany, C 3). It has a number of fine modern churches, an old Rathaus, and a university. The university, founded in 1607, was removed to Marburg in 1625, and reestablished at Giessen in 1650. It has four faculties, with an attendance of about 800 students, a good library, founded in 1617, a chemical laboratory arranged by Liebig (who was a professor here), botanical gardens, and several institutes and collections. Giessen has also a teachers' seminary, a gymnasium, a school of agriculture, etc. The chief manufactures are machinery and other metal products, textiles, chemicals, tobacco and cigars, musical instruments, etc. Population, in 1890, 20,571; in 1900, 25,491, chiefly Protestants. Giessen dates from the twelfth century, and was formerly fortified.

GIFFEN, gif'fen, Sir ROBERT (1837—). An English statistician and economist. He was born at Strathaven, Lanarkshire, and was educated at the parish school in his native town, and at Glasgow College. In 1860 he began newspaper work as a reporter on the staff of the *Stirling Journal*. In 1862 he obtained a position on the *London Globe*, which he occupied until 1866, when he was engaged as assistant to John Mor-

ley, in the *Fortnightly Review*. From 1868 to 1876 he was the assistant editor and principal contributor to the *Economist*, under the editorship of Walter Bagehot, and served during part of the same time (from 1873 to 1876) as city editor of the *London Daily News*, for which he furnished the daily trade and financial article. In 1876 he was appointed chief of the statistical department of the Board of Trade. He continued to hold office after it was merged, in 1882, with that of assistant secretary of the Board of Trade. Another change in the organization of his department was made in 1892, when he was appointed comptroller-general of the commercial, labor, and statistical departments. He retired in 1897. His writings include frequent contributions to the *Fortnightly Review*, the *Spectator*, the *Saturday Review*, and other journals and magazines, in numerous reports of exceptionally great value, and the following publications: *American Railways as Investments* (1873); *Stock Exchange Securities* (1878); *Essays in Finance* (1st series 1879, 2d series 1886); *The Progress of the Working Classes in the Last Half Century* (1884); *The Growth of Capital* (1890); and *The Case Against Bimetallism* (1892).

GIFFORD, giff'fôrd, ADAM (1820-87). A Scotch jurist and philanthropist, born in Edinburgh. He was admitted to the Scotch bar in 1849, and in 1865 was appointed sheriff of Orkney and Zetland. In 1870 he became a judge of the Court of Sessions, with the title of Lord Gifford. He gave by his will £80,000 to endow lectureships in natural theology at the four Scotch universities—Edinburgh, Glasgow, Aberdeen, and Saint Andrews.

GIFFORD, ROBERT SWAINE (1840-1905). An American landscape painter and etcher. He was born on the island of Naushon, Gosnold (Mass.), December 23, 1840, and studied marine painting with Albert van Beest, in Rotterdam. He became a member of the New York Water Color Society in 1865, making his home in New York for three years. In 1869 he visited California and Oregon; in 1870-71, Europe and Africa. Again in 1874-75 he was in Europe. Most of his important works are oil paintings, and they are typical scenes of New England landscapes. Perhaps those that portray the coast are the most interesting.

GIFFORD, SANFORD ROBINSON (1823-80). An American landscape painter. He was born at Greenfield, N. J., July 10, 1823. He attended Brown University from 1842 to 1844. He studied with the water-color painter John R. Smith of New York, a son of the celebrated London engraver. In 1851 he was elected associate of the Academy, and in 1854 he was made Academician. He made a sketching tour through England and Scotland in 1855; then went to Paris, and in 1856 he visited Belgium, Holland, Switzerland, and Italy, spending the winter of the same year in Rome. The following year he spent in Abruzzi, Naples, and Austria. Returning to New York at the beginning of the Civil War, he enlisted in the Seventh Regiment. He remained with the army through the years 1862-63. In 1868 he visited Greece, Syria, Egypt, Turkey, and Italy. In 1870 he went to the Rocky Mountains and to Alaska. In 1874 he sketched on the shores of Lake Superior. Gifford's pictures are expressive of the poetic qualities in landscape.

GIFFORD, WILLIAM (1756-1826). An English author. He was born at Ashburton, Devonshire, in April, 1756. Left an orphan at twelve, he was first a cabin-boy and then an apprentice to a shoemaker. Aided by a local surgeon who had seen some of the boy's verses, he was sent to Exeter College, Oxford, where he was graduated B.A. in 1782. He now traveled on the Continent for 'many years' as tutor to the son of Lord Grosvenor. His first publication was the *Baviad* (1794), a satire on a group of scribblers known as 'Della Crusicans' (q.v.). This was followed by the *Mæviad* (1795), a similar satire on some of the contemporary dramatists; and by a savage attack on Dr. John Wolcot, entitled *An Epistle to Peter Pindar* (1800). Wolcot retaliated with the feeble *Cut at a Cobbler*. In 1802 appeared a translation of Juvenal, which Gifford had begun at the university, and to which he now prefixed an autobiography. Gifford, who had gained the favor of Canning and his political friends, edited the *Anti-Jacobin* in 1797-98; and in 1809 he was appointed the first editor of the *Quarterly Review*. He was soon recognized as one of the severest reviewers of the time. Having no sympathy with the new schools of poets and critics, he attacked Hazlitt, Hunt, Lamb, Wordsworth, Shelley, and especially Keats, with great bitterness. (Consult review of Keats's "Endymion," in the *Quarterly*, April, 1818.) He resigned from the *Quarterly* in 1824, having amassed a fortune of £25,000. He died December 31, 1826, and was buried in Westminster Abbey. Gifford is perhaps best known to scholars by his editions of Massinger, Ben Jonson, and Ford, and notes to Shirley used by Dyce in his edition of the dramatist. This work, however, was not done very carefully. The *Baviad* and the *Mæviad* are in *British Poets*, edited by Frost (Philadelphia, 1838).

GIFT (AS., OHG. *gift*, from AS. *gifan*, Goth. *giban*, OHG. *geban*, Ger. *geben*, to give). Gift, in the broadest sense, includes every gratuitous transfer of property, whether real or personal, and whether made orally, by deed, or by will. As a specific legal term, however, it is limited to a present transfer of property without consideration. In this sense it is distinguishable from a devise or legacy on the one hand (which takes effect in the future, upon the giving owner's death) and from a barter, a grant, or a sale on the other, in each of which transactions a transfer is made upon a valuable consideration. Gifts are divisible into two classes, those *causa mortis* and those *inter vivos*. The first class has been discussed in the article on DONATION (q.v.).

It has been judicially declared that the elements necessary to the validity of a gift *inter vivos* are the following: (1) That the donor must be competent to contract; (2) there must be freedom of will; (3) the gift must be complete, with nothing left undone; (4) the property must be delivered by the donor and accepted by the donee; (5) the gift must go into immediate and absolute effect. If either of the first two elements is wanting, the gift may be avoided and the property regained by the donor, because of his legal incapacity to transfer property, or because he was the victim of fraud, duress, or undue influence. In case, however, all these essentials are present, the transfer becomes irrevocable as between the donor and donee. Even then, if it

leaves the donor insolvent it may be set aside by his creditors as a fraudulent conveyance.

The third essential of a gift—that it must be complete—distinguishes the transaction from a promise to give. A person makes a present of his promissory note for \$1000 to another. Here is no gift; only a promise to give. As a promise it is unenforceable because there is no legal consideration for it. Had the donor presented the donee with the promissory note of a third person, a gift would have been consummated. Whether the delivery to another of the donor's check constitutes a gift of so much of his bank deposit as is named in the check, or is to be considered simply a promise to give, is a question upon which the courts are divided. The weight of authority is in favor of the latter view. Any substantial act on the part of the owner of property, tending to carry the gift into effect, and to give the donee dominion over the property so that he can appropriate it to his use, will amount to a valid and effectual gift. Accordingly a savings-bank deposit may be effectually given to another by delivering to the latter the deposit book accompanied by an assignment, or by other acts which disclose the donor's intention to presently pass title and vest the donee with dominion over the fund. Oftentimes a transaction which fails of effect as a gift is upheld by the courts as a declaration of trust (q.v.) in favor of the intended donee. This will not be done, as a rule, unless it is apparent that the owner of the property actually intended to create a trust.

Delivery of the property, which constitutes the fourth essential according to the judicial statement above referred to, may be actual or constructive; thus if the property is already in the donee's possession, it is sufficient if the parties treat the property as thereafter owned as well as possessed by the donee. Neither does the law require actual acceptance by the donee in all cases. If the gift is wholly beneficial to him, his acceptance will be presumed until evidence of rejection by him is given.

The fifth requisite of a valid gift is that it go into immediate and absolute effect. The words of donation must be those of present, complete, and final transfer to the donee. Consult *Kent, Commentaries*, and the authorities referred to under *CONTRACT*.

GIFU, gē'foo'. A prefectural town of Japan, situated in the southern part of Nippon, 19 miles by rail from Nagoya (Map: Japan, E 6). The chief products are silk and paper goods. Population, in 1898, 31,942.

GIGG. See *JIG*.

GIGNOUX, zhé'nyoo', FRANÇOIS RÉGIS (1816-82). A French landscape painter, born at Lyons. He studied art at Lyons and in the Ecole des Beaux-Arts in Paris, and with Delaroche. In 1840 he came to the United States, and in that year became a member of the National Academy. He returned to France in 1870. His pictures are studies of nature in her more cheerful aspects. Among his productions are: "Spring;" "The First Snow;" "The Indian Summer;" "Niagara in Winter;" "The Bernese Alps at Sunrise;" and "Niagara by Moonlight." A number of his pictures are in private possession in New York City. He died in Paris, August 6, 1882.

GIGOUT, zhé'goot', EUGÈNE (1844-). A French organist and composer, born at Nancy.

He studied under Saint-Saëns in Paris, and in 1863 became organist of Saint Augustin's, subsequently making extended concert tours through Europe and England. In 1885 he founded an organ school in Paris, which was subsidized by the Government. Gigout's compositions are mostly for the organ, and are written in a simple, severe form. He is a chevalier of the Legion of Honor.

GIGOUX, zhé'goot', JEAN (1809-94). A French painter and illustrator, born at Besançon. He was a pupil of the Ecole des Beaux-Arts, and first exhibited in 1832. His best painting is "The Death of Leonardo da Vinci" (1835) in the Museum of Besançon. It is a solidly painted, realistic conception of the scene. These traits characterize his other works: "The Death of Cleopatra;" "The Eve of Austerlitz;" "The Good Samaritan;" "A Young Girl;" and the portraits of Fourier and Donzelot. The last three are all in the Luxembourg. His drawings include six hundred designs for an edition of *Gil Blas*, and a fine drawing of "Charlotte Corday" (1848). His collection of drawings and lithographs was left to his native town. He wrote an interesting book, *Causeries sur les artistes de mon temps* (1855), full of anecdote and art talk. He received the medal of honor at the Paris Exposition of 1889, and the cross of the Legion of Honor in 1885.

GIHON, gī'hon, ALBERT LEARY (1833-1901). An American physician and surgeon, medical director in the United States Navy, born in Philadelphia, Pa. He graduated in 1852 at the College of Medicine and Surgery in that city, in 1853-54 was professor of chemistry and toxicology in the College of Medicine, and in 1855 became an assistant surgeon in the United States Navy. In 1861 he was appointed surgeon, and in 1879 medical director. In 1895 he became senior medical director of the navy, and in the same year was retired with rank of commodore. He designed the model hospital ship exhibited at the Centennial Exhibition of 1876, and invented an ambulance cot, adopted in 1877 under his name for use in the navy. At various times he was president of the American Public Health Association, the American Academy of Medicine, and the Association of Military Surgeons of the United States. He wrote *Practical Suggestions in Naval Hygiene* (1871), and many papers, reports, and fugitive articles.

GIJÓN, hē'hōn'. An important seaport in the Province of Oviedo, Spain, 20 miles by rail north-northeast of the city of Oviedo (Map: Spain, C 1). It is situated on a peninsula projecting into the Bay of Biscay, and is one of the most flourishing towns of Asturias, its population having increased with the development of its commerce and its growing popularity as a watering place. The town is well built, the more modern quarters with wide, straight streets; a number of new buildings, including markets, a town hall, etc., have been constructed. There are statues in honor of Pelayo and Gaspar de Jovellanos, the latter a native of Gijón, who in 1794 founded the Instituto Jovellanos, which has a valuable art collection; and the Campos Eliseos with a theatre, circus, and extensive gardens. Gijón has also a large bull-ring and fine promenades; the parish church of San Pedro (fifteenth century) and the two palaces are further objects of interest. One of the old ecclesiastical build-

ings has been converted into a Government tobacco factory which employs some 1500 persons. The manufacturing establishments comprise also glass and pottery works, foundries and machine shops, wire and wire-nail factories, petroleum refineries, etc. The town, including a considerable area that is chiefly mountainous, is the port for a rich mining district, and carries on an extensive export trade in coal, copper, iron, and other minerals, lumber, and nuts. The coastwise trade is also important. Increased railroad facilities and improvements in the harbor have promoted Gijón's commerce. Population, in 1900, 46,813. Gijón is identified with the ancient *Gigia* or *Gijia*, though not on the exact site of the Roman town. Captured by the Arabs, it fell into the hands of Pelayo after the battle of Covadonga, and until near the close of the eighth century was the capital of the Asturian princes. The shattered 'Invincible Armada' repaired here in 1588.

GILA, hē'lā. A river of the United States. It rises in the Sierra Madre Mountains (q.v.) in New Mexico, and, flowing in a general westward direction across Arizona, joins the Colorado about 180 miles above where the latter empties into the Gulf of California (Map: Arizona, B 3). For the greater part of its length, which is nearly 500 miles, the Gila flows through mountain cañons, the sides of which are in many places so precipitous as to render the stream almost unapproachable. The lower part of its course is through an open and comparatively level country, much of which is made fertile by irrigation from the river. Ruined edifices, one of which is three stories high and in a fair state of preservation, broken pottery, and traces of irrigation canals along its banks show that its riparian dwellers of former times were numerous and partly civilized. About 200 miles from its mouth, in a productive portion of the valley, is the reservation of the Pima and Maricopa Indians.

GILA MONSTER (named after the *Gila*, a river in Arizona). A poisonous lizard (*Heloderma suspectum*) found in the sandy deserts of Arizona, New Mexico, and Texas. It is one of the largest lizards in North America, is closely allied to the caltetepon (*Heloderma horridum*) of Mexico, and is fat, inactive, and stupid. It is covered with bright orange and black pebble-like scales, and, like snakes, it has grooved teeth and large salivary glands at their bases. Its bite is injurious, though not often fatal to man. Drs. S. Weir Mitchell and E. F. Reichert found that the saliva injected into pigeons and fowls was quickly mortal; but the experiments of Dr. Irwin of the United States Army (1862-63), Dr. H. C. Yarrow of the United States National Museum, and of Samuel Garman, have failed to substantiate the earlier conclusions, so that the question of the poisonous nature of this lizard is not definitely settled. An illustrated monograph upon its anatomy was contributed by Shufeldt to the Zoölogical Society of London, and printed in their *Proceedings* (London, 1900). See **HELODERMA**; and **PLATE OF IGUANA AND OTHER AMERICAN LIZARDS**.

GILAN, gē-lān'. See **GHILAN**.

GILBERT, SAINT. See **GILBERTINES**.

GILBERT, gil'bert, Mrs. ANNE HARTLEY (1821-1904). A well-known and popular actress.

She was born in Lancashire, England, and in her youth became a dancer. In 1846 she was married to George H. Gilbert, with whom, after appearing in many of the British theatres, she came to this country in 1849. Her first hit in a speaking part was as Wicahenda in Broughman's *Pocahontas* (1857). In 1869 she joined Daly's company, and became familiar in the characters of the odd elderly ladies of the stage, such as Mrs. Candour in *The School for Scandal*, Mrs. Hardcastle in *She Stoops to Conquer*, and many others. After Mr. Daly's death she came under Charles Frohman's management, and later became a member of Annie Russell's company. Her eightieth birthday was celebrated in Saint Louis, where she was supporting Miss Russell in *The Royal Family*. Mrs. Gilbert published her stage reminiscences in 1901.

GILBERT, CHARLES BENAJAH (1855—). An American educator, born at Wilton, Conn. He graduated at Williams College in 1876, and was principal of high schools at Mankato, Winona, and Saint Paul, Minn., and Beaver Dam and Oshkosh, Wis. From 1889 to 1896 he was superintendent of schools at Saint Paul, and from 1896 to 1901 at Newark, N.J. In 1901 he accepted a similar post at Rochester, N. Y. He was elected president of the National Association of School Superintendents in 1897, and in 1897-1900 was a lecturer at the Teachers' College of Columbia University. With S. L. Arnold he wrote *Stepping Stones to Literature* (1897).

GILBERT, DAVID MCCONAUGHY (1836—). An American clergyman and author, born at Gettysburg, Pa. He studied there at Pennsylvania College, and the theological seminary of the Lutheran Church, and was ordained in 1860 to the ministry of that denomination. His pastorates were at Staunton, Va., in 1859-63 and 1871-73; at Savannah, Ga., in 1863-71; and at Winchester, Va., from 1873. In 1886 he was elected first president of the United Southern Synod of the Lutheran Church. Among his publications are: *The Lutheran Church in Virginia, 1776-1867* (1876); *The Synod of Virginia: Its History and Work* (1879); and *The Annihilation Theory Briefly Examined* (1879).

GILBERT, zhél'bar', FRANÇOIS AMBROISE GERMAIN (1816-91). A French sculptor, born at Choisy-le-Roi (Seine). He was best known for his work in what is generally classed as industrial sculpture, such as elaborate centre-pieces for dining-tables, and the like. The decoration of the Bourse at Marseilles, the restoration of the sculptures in the Rheims Cathedral, and a bas-relief in the Church of Saint Augustine, Paris, were also executed by him.

GILBERT, gil'bert, GROVE KARL (1843—). An American geologist, born in Rochester, N. Y. He graduated from the university in that city in 1862. For several years he studied geology and paleontology with Prof. H. A. Ward, of Rochester, supplementing his studies by field work with the Ohio Geological State Survey in the capacity of assistant. In 1871 he received an appointment to the United States Geological Survey. As assistant to Major J. W. Powell, the director of the Survey, he was engaged from 1875 to 1879 in mapping and describing the geology of portions of the Rocky Mountain region. Afterwards he was placed in charge of the

Appalachian Survey, and for a time held the office of chief geologist. He was one of the first to study the relations between geological structure and surface features, and in this connection he rendered most valuable services to science. Some of his more important contributions to geological literature are: *Report on the Geology of the Henry Mountains* (1877); *Report on the Geology and Resources of the Black Hills of Dakota* (1880); *The Topographic Features of Lake Shores* (1885); and *Lake Bonneville* (1890).

GILBERT, Sir HUMPHREY (1539?-83). An English soldier and navigator. He was born at Compton, Devonshire, and was, on his mother's side, a half-brother of Sir Walter Raleigh. He was educated at Eton and at Oxford. He saw active service in Normandy under the Earl of Warwick, in 1563, as well as in the Irish campaigns of 1566-70. In 1571 he returned to England, and in the following year was sent into the Netherlands with a force of 1500 English volunteers to aid the Dutch. After a futile campaign Gilbert returned to England, and spent the next five years in retirement in "sundry profitable and very commendable exercises" in literature. During this period he wrote the *Discourse of a Discovery for a New Passage to Cataia*, produced partly in support of two petitions presented to the Queen in 1566, for a commission to search for a northwest or northeast passage. The *Discourse*, with some additions, was edited by the poet George Gascoigne, in 1576. In 1577 Gilbert published another treatise, suggesting a plan of 'reprisals' against the King of Spain, and in 1578 he received a commission from Elizabeth, which covered the privileges of discovery and colonization. An expedition was immediately fitted out by Gilbert and Sir Walter Raleigh, but was dispersed by the Spaniards off Cape Verde, and the next four years were spent by the indefatigable adventurer in endeavors to raise the necessary funds for another undertaking. On June 11, 1583, he sailed from Plymouth with five ships, but the largest—a barque furnished by Raleigh—returned to England after two days at sea. Gilbert made his way across the Atlantic, and on July 30th reached the coast of Newfoundland, and determined to plant his colony near the harbor of Saint John's, where he took possession of the country in the name of the Queen. This, the first English colony in America, was made up of broken-down gentlemen and seamen, and the lawlessness of the community was beyond Gilbert's control. Arrangements were made to return to England, whence Gilbert hoped to make another attempt at colonization in the following spring. Meanwhile he explored the coast of Newfoundland toward the south, and lost his largest ship on the shoals off Cape Sable or Cape Breton Island. Disregarding the advice of his friends, he persisted in sailing in the *Squirrel*, the smaller and less seaworthy of the two remaining vessels. A storm was encountered off the Azores. "On Monday, September 9th," reports Hayes, the captain of the other vessel, the *Golden Hind*, "the frigate was near cast away, yet at that time recovered; and giving forth signs of joy, the general, sitting abaft with a book in his hand, cried out unto us in the *Hind*: 'We are as near to heaven by sea as by land.' That same night the watch

on board the *Hind*, observing that the frigate's lights suddenly disappeared, cried out: 'The general was cast away,' which was too true; for in that moment the frigate was devoured and swallowed up in the sea." Some account of Gilbert's career may be found in Bourne, *English Seamen Under the Tudors* (London, 1868), and also in Markham, *The Fighting Veres* (London, 1888). The original narrative of his voyage is in Hakluyt, *English Voyages* (London, 1600; new ed. 1812; Goldschmid, Edinburgh, 1889). Consult also Payne, *Voyages of the Elizabethan Seamen* (London, 1880).

GILBERT, Sir JOHN (1817-97). An English historical painter, illustrator, and engraver. He was born at Blackheath, July 21, 1817. He learned every technique possible for art expression—oils, water-color, fresco, wood and stone engraving, etching, carving, and drawing—and was in the main self-taught. Gilbert gave most of his attention to illustration, in 1838 beginning with illustrations of a book of nursery rhymes. These were followed by illustrations for the editions of the poets, Cowper (1841), Pope, Burns, and others included in Rutledge's *British Poets* (1853); *Evangeline* (1856); Longfellow's *Poems* (1858); Scott (1857); Wordsworth (1859); Milton (1864). His chief work was 829 illustrations for Howard Staunton's edition of Shakespeare (1856), the proofs of which are in the collections of the British Museum.

In 1843 he sent a few drawings to *Punch*, designing the cover for that year; but for thirty years, following the establishment of the *Illustrated London News*, in 1842, he was a constant contributor; also to the *London Journal*. In 1852 he was elected an associate of the Water-Color Society, and a full member in 1854. He initiated the exhibitions of this society in 1862 by hanging 270 of his own drawings and sketches, which led to a regular winter exhibition. Gilbert was made president of the society in 1871, on which occasion he was knighted. In 1893 he presented to the nation a collection of his works, which were divided among the galleries in London, Birmingham, Liverpool, and Manchester. To the Royal Academy he presented his sketch-books. His life was uneventful; his industry was marvelous, as the number of his drawings—thirty thousand—testifies. He died at Blackheath, October 5, 1897. He was a great draughtsman and illustrator rather than a painter, although he was a good colorist, with a fondness for red; yet he often made his shadows too black. Consult: Spielman, "Sir John Gilbert," in the *Magazine of Art* (London, 1898); Atkinson, *English Artists of the Present Day* (ib., 1872).

GILBERT, JOHN GIBBS (1810-89). An American comedian. Born in Boston, he made his first appearance there at the Tremont Theatre, in 1828, as Jaffier in *Venice Preserved*. His original aim was to be a tragedian; but while on a tour through the South and West, the success of his Sir Anthony Absolute, Master Walter, etc., convinced him that his true bent was for 'old men' parts, and he soon became the leading American actor in that line of comedy. In 1847 he had a successful engagement in London. From 1862 until the close of Wallack's Theatre, New York, he was connected with that house. His most famous rôle was that of Sir Peter Teazle in *The School for Scandal*; his Sir Anthony, Old

Dornton in *The Road to Ruin*, and Lord Ogleby in *The Clandestine Marriage*, were also noted. He died June 17, 1899. Consult: Winter, "A Sketch of the Life of John Gilbert," *Dunlap Society Publications* (New York, 1890); McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896); and Carroll, *Twelve Americans: Their Lives and Times* (New York, 1893).

GILBERT, Sir JOHN THOMAS (1829-98). An Irish antiquary, born in Dublin. He received his education at Bective College in Dublin, and at Prior Park College in Bath. His antiquarian tastes developed early. In 1855 he became one of the honorary secretaries to the Irish Celtic and Archaeological Society, and took an active part in organizing the new public record office at Dublin, of which he was appointed secretary (1865-75). In 1855 he was elected to the Royal Irish Academy, of which he was librarian for a quarter of a century. He also held many positions of public trust. In 1892 he received the degree of LL.D. from the Royal University, and in 1897 he was knighted. Gilbert's researches in the sources of Irish history are of the very highest value. Among his numerous works are: *Historical Essays on Ireland* (1851); *Celtic Records and Historical Records* (1852); *History of the City of Dublin* (1854); *Ancient Historical Irish Manuscripts* (1861); *Public Records of Ireland* (1863); *History of the Viceroy's of Ireland* (1865); *Facsimiles of National Manuscripts of Ireland* (1874); *A Contemporary History of Affairs in Ireland from 1641 to 1652* (1879); *Account of Facsimiles of National Manuscripts of Ireland* (1884); *A Jacobite Narrative of the War in Ireland* (1892); *Documents Relating to Ireland* (1893); *Crede Mihi, the Most Ancient Register of the Archbishops of Dublin Before the Reformation, A.D. 1275* (1897).

GILBERT, Sir JOSEPH HENRY (1817-91). An English agricultural scientist, born at Hull (Yorkshire). He studied at Glasgow University, University College, London, and at the laboratory of Liebig, University of Giessen, and in 1840-43 was successively assistant to Prof. A. T. Thompson at University College and chemist to a calico manufactory near Manchester. In 1843 he became associated with Mr. (later Sir) J. B. Lawes (q.v.) in connection with the agricultural experiment station established upon the latter's estate at Rothamsted (near Saint Albans, Hertfordshire). He was director of the laboratory from 1843 until the death of Lawes in 1900, and from that time director of the station. He was appointed professor of rural economy at Oxford in 1884 and 1887. In 1860 he was elected a fellow of the Royal Society, and in 1882-83 was president of the Chemical Society, of which he had been elected a member in 1841. He traveled for scientific purposes in the United States in 1882, 1884, and 1893. The combined services of himself and Lawes to the development of agricultural chemistry, dating from the establishment of the Rothamsted station, one of the first of such institutions, have been epoch-making. In addition to a large number of essays prepared with Lawes for the *Journal of the Royal Agricultural Society of England*, the *Journal of the Chemical Society*, the *Transactions of the Royal Society*, and various other periodicals and reports, he wrote: *Amount and Composition of the Rain and Drainage Waters at Rothamsted* (1882, with

Lawes and Warington); and *Agricultural Investigations at Rothamsted, England, During a Period of Fifty Years* (1895; Bulletin 22 of the United States Official Experiment Station).

GILBERT, LINDA (1847-95). An American philanthropist. She was born in Rochester, N. Y., but when very young was taken by her parents to Chicago, where she was educated in Saint Mary's Convent. She early became interested in the cause of prison reform, and through her efforts libraries aggregating 30,000 volumes, and ranging from 1500 to 2000 volumes each, were placed in various prisons throughout the country. She was also instrumental in securing the incorporation of the Gilbert Library and Prisoners' Aid Society, under the laws of the State of New York, having for its object the improvement of prison discipline, the placing of selected libraries in every prison and jail, the care of prisoners' families when in need, and the assistance of those discharged from prison. The greater part of her work was done in her individual capacity, the society, through lack of funds, having been prevented from proceeding far with the work for which it was organized.

GILBERT, zhèl'bar', LOUIS PHILIPPE (1832-92). A Belgian mathematician, born at Beauraing (Namur). He was a professor at the University of Louvain, a member of the Royal Academy of Belgium, and a correspondent of the Institute of France. His published works, chiefly on pure mathematics and their history, include a *Cours de mécanique analytique* (1877), and *Recherches sur les propriétés géométriques des mouvements plans* (1878).

GILBERT, NICOLAS JOSEPH LAURENT (1751-80). A French poet, born at Fontenay-le-Château, Lorraine. He had already written some mediocre verse and a novel when he went to Paris in 1772. He presented a poem at the Academy, which was not well received, and this seems to have caused him to become a satirist. His works in this vein include: *Le dix-huitième siècle* (1775), and *Mon apologie* (1778). He also wrote some odes, and a few days before his death his best known poem, "Adieux à la vie." For many years he was considered a French Chatterton, and to be dying of want, but as a matter of fact he was in receipt of three pensions at the time. Alfred de Vigny made a hero of him in *Stello*. His complete works were first published in 1788.

GILBERT, gil'bèrt, RUFUS HENRY (1832-85). An American physician and inventor. After graduating at the College of Physicians and Surgeons in New York City, he began medical practice at Corning, N. Y., at the outbreak of the Civil War became a surgeon in the Duryea Zouaves (Fifth New York Infantry), and rose to be medical director and superintendent of the Central Railway of New Jersey. Afterwards he made a study of the rapid-transit problem in New York City, as a result of which he devised the elevated railway, originally in tubular pneumatic forms, but afterwards more nearly resembling the present system. Under his direction the Sixth Avenue Elevated Railway (in New York City), then known as the Gilbert Elevated Railway, was constructed. In 1878 the management of the railway was assumed by the Metropolitan Transit Company. Charges of fraud were subsequently made by Dr. Gilbert against his associates, and much litigation followed.

GILBERT, WILLIAM (1540-1603). A distinguished English natural philosopher and physician, who has been termed 'the father of magnetic philosophy.' He was born at Colchester, of which town his father was recorder. He was a member and subsequently fellow of Saint John's College, Cambridge; was B.A. in 1560, M.A. in 1564, and M.D. in 1569. About the year 1573 he settled in London as a practicing physician, joined the College of Physicians, and was appointed physician to Queen Elizabeth. The time that he could spare from the duties of his profession was employed in philosophical experiments, particularly in relation to the magnet; and in these he was assisted by a pension from the Queen. After holding various offices in the College of Physicians he was finally elected its president in 1600. At the death of the Queen he was continued in his office of Court physician by James I. until his death in 1603. His death seems to have taken place in London; but he was buried at Colchester, in the Church of the Holy Trinity, where there is a monument to his memory. He left his library, globes, instruments, and cabinet of minerals to the College of Physicians. From his birthplace, he is generally designated as Gilbert of Colchester. His important works are: *De Magnete, Magneticisque Corporibus, et de Magno Magnete, Tellure*, *Physiologia Nova* (1600), of which there are several editions; and *De Mundo nostro Sublunari Philosophia Nova* (1651) (published from a manuscript in the library of Sir William Boswell). The first of these works has served as the basis of subsequent investigations in terrestrial magnetism, and contained all the fundamental facts of the science as they were known at that time. Gilbert establishes the magnetic nature of the earth, which he regards as one great magnet, and discusses variations and the bearing of magnetic phenomena on navigation. He was the first to use the terms 'electric force,' 'electric attraction,' and 'magnetic pole,' and to point out that amber is not the only substance which, when rubbed, attracts light objects, but that the same faculty belongs to the resins, sealing-wax, sulphur, glass, etc. These substances he termed 'electrics,' while the metals and other material which would not exert the force of attraction upon being rubbed he called non-electrics. The publication of his treatise *De Magnete*, which was the first great work on physical science to be published in England, will always be regarded as constituting an epoch in the history of magnetism and the allied sciences. Consult: William Gilbert of Colchester, *On the Loadstone and Magnetic Bodies, and on the Great Magnet, the Earth*, translated by Mottelay (London, 1893), which contains a biographical memoir.

GILBERT, WILLIAM SCHWENCK (1836—). An English dramatist, best known for the comic operas in which he collaborated with the composer, Sir Arthur Sullivan. He was born in London, and took his degree at London University. From 1857 to 1862 he was a clerk in the Privy Council office; in 1864 he was called to the bar of the Inner Temple. He had been a contributor to *Fun* (for which he wrote his well-known *Bab Ballads*) and to other periodicals for several years, when in 1866 he wrote his first play, a burlesque called *Dulcamara*. It was the first of a long list. Among his comedies, after such light pieces as *The Merry Zingara* and others, came *The Palace of Truth* (1870); *Pyg-*

malion and Galata (1871); *The Wicked World* (1873); *Sweethearts* (1874); *Broken Hearts* (1876); *Dan'l Druce, and Engaged* (1877). In 1875 he and Arthur Sullivan began to work together. Their most famous pieces are: *H. M. S. Pinafore* (1878); *The Pirates of Penzance* (1879); *Patience, or Bunthorne's Bride* (1881); *Iolanthe* (1882); *The Mikado* (1885); *The Gondoliers* (1889). All these had phenomenally long runs. In 1891 he published a collection of his songs under the title, *Songs of a Savoyard*, reprinted in 1897 in one volume with the *Bab Ballads*. The *Mountebanks* he produced in 1892 with Alfred Cellier. Since then he has written *His Excellency* and *The Grand Duke*.

GILBERT DE LA PORRÉE, zhél'bar' de là pór'ra', or, in Latinized form, GILBERTUS PORRETANUS (1070-1154). A scholastic theologian. He was born at Poitiers, France, 1070, educated at Chartres, and became Bishop of Poitiers in 1142. He was eminent as a philosopher, but was accused of heresy by Bernard of Clairvaux, and was tried at Rheims (1148). On promising to correct his errors he was allowed to go free. He died at Poitiers, September 4, 1154. His chief work was a *Commentary* on Boëthius on the Trinity, reprinted in Migne, *Patrol. Lat.*, lxiv.

GILBERTINES, gil'bēr-tinz. A religious order which formerly existed in England, where it was founded about 1141 by Saint Gilbert, a native of Sempringham in Lincolnshire. He first established a convent of seven nuns, besides lay sisters, and prescribed for them the Benedictine rule. He intended to place them under the direction of the Cistercians, but when this did not seem practicable he founded a congregation of priests and lay brothers to have the care of the nuns, while dwelling in a separate cloister. To these he gave the rule of Saint Augustine modified by Cistercian discipline. The foundation was confirmed by Eugenius III. in 1146, and at the founder's death in 1189 had thirteen cloisters, of which nine were double, 700 male and 1200 female religious. It continued to flourish, but without extending beyond England, until the dissolution of the monasteries, at which time it numbered twenty-two houses. Consult Graham, *Saint Gilbert of Sempringham and the Gilbertines* (London, 1901).

GILBERT ISLANDS. A British archipelago in Oceanica, situated on the equator and between longitudes 172° and 177° E. southeast of Marshall Islands (Map: Australasia, K 2). It consists of 16 small inhabited islets covering a total area of about 166 square miles. They are mostly low, and contain numerous lagoons. The largest of them are Taputeuca, Arorai, Nonuti, Apama, Maiana, and Maraki. The climate is favorable. The chief product of the group is copra. There are over 35,000 colored inhabitants, mostly uncivilized, but including a number of converts to Christianity. The group was discovered by John Byron in 1765, and one of the islands is called Byron. They came into the possession of Great Britain in 1892.

GIL BLAS, zhél blás. See LE SAGE.

GILBOA, gil-bō'a (perhaps an early corruption of Heb. *gib'ath habba'al*, hill of Baal). The biblical name of a range of hills on the eastern side of the plain of Esdraelon (q.v.). Their height varies from a few hundred to 2000 feet.

The hills were the scene of the death of King Saul and his three sons, after their defeat by the Philistines (I. Sam. xxxi.; II. Sam. i. 6; I. Chron. x. 1-8). The modern name of the hills is Jebel Fuku'a.

GILCHRIST, gil'kríst, ALEXANDER (1828-61). An English biographer, born in London. He studied law at the Middle Temple, and was called to the bar in 1849, but relinquished a legal career for that of a man of letters. His contributions to the *Eclectic Review*, the *Literary Gazette*, and the *Critic* were numerous. His chief work is his *Life of William Blake* (1863), the artist of the "Inventions to the Book of Job," with selections from Blake's writings. He wrote also a *Life of William Etty, R.A.* (2 vols. 1855). He was a friend of D. G. Rossetti, and of Carlyle, to whom he was from 1856 next-door neighbor in Cheyne Row. Consult: *Memoir of Alexander Gilchrist*, prefixed to the second edition (London, 1880) of the *Life of Blake*. See **BLAKE, WILLIAM**.

GILCHRIST, WILLIAM WALLACE (1846—). An American organist, choral conductor, and composer, born in Jersey City, N. J. He studied music under Professor Clarke at the University of Pennsylvania, and afterwards took up the profession of teaching, in which he was eminently successful. From 1873 to 1877 he was choirmaster of Saint Clement's Church, Philadelphia, from which he went to Christ's Church, Germantown, as organist and choirmaster. In 1882 he joined the faculty of the Philadelphia Musical Academy, and in the same year won the prize in composition at the Cincinnati Musical Festival with his *Psalm XLVI.*, written for solos, chorus, orchestra, and organ. Two years before he had won the Mendelssohn Glee Club (New York) prize, with the composition *Autumn Dreaming*. He was conductor of several important Eastern choral societies, and his compositions, particularly for the Church, are very widely known. Other important compositions are: *Song of Thanksgiving*, arranged for chorus and orchestra; a cantata, *The Rose* (1887); and the *Ode to the Sun*.

GILDAS, gil'das, or GILDUS, gil'dūs (?-570). A British historian, known as Saint Gildas the Wise. According to Mommsen, he was born at the end of the fifth or at the beginning of the sixth century; certainly before 504. He spent the last years of his life in Brittany. His *De Excidio et Conquestu Britanniae* was first printed in London in 1525, and has been often reprinted, both in England and on the Continent. This work derives its value mainly from the lack of other sources for the period. Gibbon has described Gildas in a single sentence: "A monk, who, in the profound ignorance of human life, has presumed to exercise the office of historian, strangely disfigures the state of Britain at the time of its separation from the Roman Empire." His narrative extends from the invasion of Britain by the Romans to the author's own time. The best edition of Gildas's work is by Mommsen, in the *Monumenta Germaniae Historica*. The introduction is excellent. For other editions and for secondary works, consult Gross, *Sources and Literature of English History* (London, 1900). See **NENNIUS**.

GILDED AGE, THE. A story by Mark Twain and Charles Dudley Warner (1873), satirizing

politics and society. It introduces the typical character of Col. Mulberry Sellers.

GILDEMEISTER, gil'de-mí'stēr, JOHANN (1812-90). A German Orientalist, born at Klein-Siemen (Mecklenburg). He studied at Göttingen and Bonn; in 1830 became lecturer in Oriental languages and literatures at Bonn, and in 1844 professor there. From 1845 to 1859 he was at Marburg as professor of theology and Oriental literature, and in the latter year accepted the chair of Oriental languages at Bonn. His publications include: *Scripti Sententiæ* (1874); *Esdra Liber Quartus Arabice* (1877); *Idrisii Palæstina et Syria Arabica* (1885); and an edition of the *Meghaduta* and *Crigaratilaka* (1840) of Kalidasa. He was one of the founders of the German Oriental Society.

GILDEMEISTER, OTTO (1823-1902). A German journalist and translator, born in Bremen. In 1850 he became editor-in-chief of the *Weser-Zeitung* of Bremen. He is known for his German renderings of Byron's complete works (1864-65; 4th ed. 1888); of a number of plays of Shakespeare, including the historical ones, for the Bodenstedt edition; of Shakespeare's *Sonnets* (1871); Ariosto's *Orlando Furioso* (4 vols., 1882); and Dante's *Divina Commedia* (1888; 3d ed. 1900).

GILDER, gil'dēr, JEANNETTE LEONARD (1849—). An American journalist and critic. She was born at Flushing, N. Y., October 3, 1849; was connected from 1869 with various newspapers in Newark and New York, was associated with her brother, Richard Watson Gilder, in the editorship of *Scribner's Monthly*, now the *Century*, and since 1881 has been joint editor with her brother, Joseph B. Gilder, of the *Critic*. She has also served as literary correspondent for American and English journals, and written several books: *Representative Poems of Living Poets*; *Pen Portraits of Literary Women* (with Helen G. Cone); *Essays from the Critic* (with Joseph B. Gilder); *Authors at Home*; *The Autobiography of a Tomboy*; and *Taken by Siege*. She has also done original work in the drama and in fiction.

GILDER, RICHARD WATSON (1844—). An American poet and editor. He was born in Bordentown, N. J., February 8, 1844, the son of the Rev. William Henry Gilder, at whose seminary in Flushing, Long Island, he was educated. During the Civil War, while a student of law in Philadelphia, he served as a private in Landis's Battery at the time of the invasion of Pennsylvania. After some experience in editorial work, he, with Newton Crane, founded the *Newark Register*, and later was editor of *Hours at Home*, and afterwards assistant editor of *Scribner's Monthly*, into which the former was merged. In 1881 he succeeded Dr. Holland as editor-in-chief of the latter under its new name of the *Century*, a position which he still holds (1903). Mr. Gilder takes an active interest in all public affairs, especially those which tend toward reform and good government, and is a member of many New York clubs. He was one of the founders of the Society of American Artists, of the Authors Club, and of the International Copyright League; also chairman of the New York Tenement House Commission of 1894. He was first president of the New York Kindergarten Association; vice-presi-

dent and acting president of the City Club of New York; president of the Public Art League of the United States; a member of council of the National Civil Service Reform League; a founder of the Anti-Spoils League; and a member of the American Institute of Arts and Letters. He has published volumes of poems, as follows: *The New Day* (1875); *The Celestial Passion; Lyrics; Two Worlds; The Great Remembrance* (these in one volume); *Five Books of Song* (1894); *For the Country* (a selection, 1897); *In Palestine, and Other Poems* (1898); and *Poems and Inscriptions* (1901).

GILDER, WILLIAM HENRY (1838-1900). An American Arctic explorer, born in Philadelphia, Pa. At the beginning of the Civil War he enlisted in the Fifth New York Infantry (Duryea's Zouaves), subsequently was transferred to the Fortieth, and was mustered out with the rank of captain and brevet major. In 1871-77 he was managing editor of the *Newark Register*, and in 1878-80 was second in command on the expedition of Lieutenant Schwatka in search of the relics of Sir John Franklin. He accompanied the De Long expedition on the *Rodgers* under Captain Berry, and after the burning of the vessel on the western shore of Bering Strait, made a midwinter journey of nearly 2000 miles across Siberia to telegraph to the Government the news of the disaster. He afterwards participated in the search for De Long in the Lena Delta. In 1883 he was in Tonquin during the French-Anamese War, and in 1884 visited the region of the earthquakes in Spain. On his expeditions and travels he was a correspondent of the *New York Herald*. He published *Schwatka's Search* (1881), and *Ice-Pack and Tundra* (1883).

GILDEROY, gil'dër-oi. The romantic hero of a ballad preserved in Percy's *Reliques*, and a veritable character, Patrick of the Clan Gregor, in the annals of Perthshire, who was hanged as a highwayman, with five of his companions, in 1638. It was his boast that he had picked Cardinal Richelieu's pocket, robbed Cromwell, and hanged a judge.

GILDERSLEEVE, gil'dër-slëv, BASIL LANE-NEAU (1831—). A distinguished American classical scholar, born at Charleston, S. C. He graduated from Princeton in 1849, and then studied in Germany at the Universities of Berlin, Bonn, and Göttingen, receiving the degree of Ph.D. from the last place in 1853. Upon his return to the United States he was called to be professor of Greek in the University of Virginia, a position which he held from 1856 to 1876. He was also professor of Latin, 1861-66. In 1876 he was appointed to the professorship of Greek at Johns Hopkins University, which position he continues to hold at the present time. He has been the editor of the *American Journal of Philology* since its establishment, in 1880, and by his own writings has made valuable contributions to the syntax of Greek and Latin and to the history of Greek literature. On his seventieth birthday some of his former pupils, most of them professors in universities, published a collection of their Studies, an octavo volume of more than 500 pages (Baltimore, 1902). He has published numerous works: *A Latin Grammar* (1867, 1894, 1899); *Persius* (1875); *Justin Martyr* (1877); *Pindar* (1885); *Essays and Studies* (1890); *Greek Syntax*, part i. (1900). He received the degree of

LL.D. from William and Mary (1869) and Harvard (1896); D.C.L., University of the South (1884); L.H.D., Yale (1891), Princeton (1899).

GILDING (from *gild*, AS. *gyldan*, from *gold*). The art of covering a surface with a thin layer of gold. There are many processes of gilding, varying with the nature of the substance to be gilded and the kind of effect desired. The different methods, however, may be grouped under the three general classes of mechanical gilding, chemical gilding, and encaustic gilding.

MECHANICAL GILDING consists of applying gold leaf directly to a surface which has been previously prepared by the application of a size. The gold leaf, being placed on the size while it is only partially dry, adheres. Various forms of gold leaf, and various substitutes as well, are used for gilding. There is the genuine deep or reddish gold; pale gold, the paleness being due to a silver alloy; silver leaf, afterwards colored or varnished to imitate gold; and 'Dutch' leaf, a copper alloy having an appearance similar to gold. The gilding material is sold in 'books,' a gold book usually containing 24 leaves, 3 inches square. Several different sizes are also used, of which the commonest are 'old gold size,' a mixture of litharge, linseed-oil, and ochre, and 'water size,' made by dissolving isinglass in boiling water, and adding an equal volume of spirits, and then straining the mixture through silk. Gilding may be applied in this manner to wood, cardboard or paper, textiles, metals, masonry, or ivory. When applied to cards, papers, or textiles, the surface must be rendered non-absorbent by a preliminary sizing of weak glue before the regular gilding size is applied. Before gilding a metal surface it must be painted, to protect the surface from oxidation and decay. Metals, however, are rarely gilded by the mechanical process. Masonry, before being gilded, must be 'satisfied'—that is, its porous surface must be rendered waterproof by a solution of shellac and gutta-percha, in naphtha or some other equally efficacious coating. In gilding ivory a warm size is applied. Plaster of Paris needs several preliminary coats of boiled linseed-oil before the gold size is applied. The object of the preparatory treatment of all surfaces is, of course, to secure a smooth, impenetrable, and permanent surface on which to lay the gold leaf. The leaf is accurately cut the desired shape, and applied to the sized surface by means of special tools. After being carefully brushed, to remove stray fragments, the gilding is given a final coat of specially prepared varnish. Glass is gilded by a special process. The gold sheet is made to adhere to the *back* of the glass simply by moistening it with the breath, the glass having been previously cleaned by a preparation of whiting, rubbed off with silk. The pattern is marked in reverse on the back, and that part of the gold inclosed in the pattern fixed by a coat of Brunswick black or other size. After this has thoroughly dried, the portions not included in the pattern are carefully rubbed off with wet cotton. Where gilt ornaments are to be put on a japanned ground, they are by one method painted with gold size, and gold leaf afterwards applied. By another way, rather more than the space the ornament is to occupy is wholly covered with gold leaf, adhering with isinglass. The ornament is then painted on with asphaltum,

which protects the gold beneath it while the superfluous leaf is being washed away. A little turpentine will then remove the protecting asphaltum so as to display the gilt ornament.

GILEAD, gil'ê-ad (Heb. *Gil'ad*; connected with Ar. *jal'ad*, hard, rough). A mountainous district on the east side of the Jordan, whose boundaries are variously conceived in different portions of the Old Testament. In general, it includes the whole mountain region between the Yarmuk on the north and the Arnon on the south, the eastern boundaries being formed by the desert tablelands of Arabia (the plains of Bashan), and the western by the Jordan. In spite of its name, Gilead is a beautiful and fruitful region. The vegetation is luxuriant, especially in the central part round the brook Jabbok, where forests of oak and terebinth occur. Gilead, in fact, is better provided with water and woodland than any part of Western Palestine. It formerly produced gums and spices. The hills are not very high, and they have broad summits almost like tablelands. The district is well adapted for pasturage (Num. xxxii. 1). Gilead was much exposed to Bedouin raids from the east and other hostile attacks, and its history has much to do with wars. The land was conquered from Sihon and Og, and handed over to Reuben, Gad, and the half tribe of Manasseh (Num. xxi. 21-26; Deut. iii. 16). These tribes held it against the Midianites (Judges viii.), Ammonites (Judges xi. 32; xii. 3), and Syrians (II. Kings ix. 14), but finally lost it to the Assyrians. Tiglathpileser captured the land and carried the inhabitants captives (I. Chron. v. 26). Gilead is also interesting as forming a refuge to which Absalom fled (II. Sam. xiii. 38) when fearing the anger of his father; while subsequently, during the rebellion of Absalom, David found an asylum there (II. Sam. xvii. 27-29). It was in Gilead, likewise, that Ishbosheth, the son of Saul, was proclaimed King by Abner (II. Sam. ii. 8-9). The valiant men of Jabesh-Gilead performed the last rites for the bodies of Saul and his sons after the battle of Mount Gilboa (I. Sam. xxxi. 11-13). Elijah sojourned there (I. Kings xvii. 1), and Jesus made visits to this region. In the wars of the Maccabees Gilead played an important part, and under Roman occupation its natural resources were greatly developed. Among the principal cities were Mahanaim, Succoth, Penuel, Mizpeh, and Jazer; in latter times Pella and Gerasa. A conspicuous mountain (perhaps the Jebel Osha) was known as the mountain of Gilead (Gen. xxxi. 21 sqq.). Consult: Oliphant, *The Land of Gilead* (London, 1880); Merrill, *East of the Jordan* (New York, 1881).

GILES, jilz, SAINT (Gk. *Alydius*, *Aigidios*, Lat. *Ægidius*). A hermit of France and abbot of a Benedictine monastery in the second half of the seventh century. He is said to have been an Athenian of royal descent, from early years distinguished for piety and charity. Annoyed by the publicity to which his reputation as a holy man exposed him at home, he went to Provence about 665, and took up the hermit life in a solitary spot near the mouth of the Rhône, living upon herbs and the milk of a hind which came to his cell at stated hours. Here he was discovered by the King of the Goths, who while hunting followed the hind to the hermit's cave. Reluctantly *Ægidius* consented that a monastery

should be established at the place. He became its first abbot, and held the office till his death.

GILES, HENRY (1809-82). An Irish-American clergyman, lecturer, and essayist. He was born in County Wexford, Ireland, and was educated in the Roman Catholic faith at the Royal Academy at Belfast; but he afterwards joined the Unitarian Church, and held pastorates at Greenock and Liverpool. In 1840 he came to the United States, where he soon became known as a lecturer and essayist of considerable force and originality. He published: *Lectures and Essays* (1845); *Christian Thought on Life* (1850); *Illustrations of Genius in Some of Its Applications to Society and Culture* (1854); *Human Life in Shakespeare* (1868); and *Lectures and Essays on Irish and Other Subjects* (1869).

GILES, WILLIAM BRANCH (1762-1830). An American politician and legislator. He was born in Amelia County, Va.; was educated at Hampden-Sidney and Princeton colleges; studied law with Chancellor George Wythe, and practiced law for several years in Petersburg, Va. In early life he was a Federalist in politics, but association with Jefferson's followers in his native State caused him to change his views, and he was elected to Congress in 1791 as a Republican. During his career in the House, which lasted from 1791 to 1803, with the exception of the session of 1799-1801, he was looked upon as the leader of the extreme Republicans. He signalized his entry into the House in 1791 by actively opposing the proposition for the establishment of the United States Bank. In January, 1793, he made a bitter attack on Hamilton, then Secretary of the Treasury, whom he accused of corruption, and when, after an investigation, Hamilton easily vindicated his acts, Giles ignored the result of the inquiry, and pressed resolutions of censure, which the House refused to adopt. In 1795 he led the opposition to the Jay Treaty (q.v.). In 1798 he was an earnest advocate of the principles of the Virginia Resolutions, joining with Madison, Taylor, and Wilson Cary Nicholas in securing their adoption. From 1799 to 1801 he served in the Legislature of Virginia, and in the latter year returned to Washington. He used the most bitter invectives in his debates, declared that the nation was being undermined by monarchical tendencies, and openly charged the Federalist leaders with being in the pay of Great Britain. On the other hand, no man in the Republican ranks was more thoroughly detested by the Federalists than Giles. He succeeded Wilson Cary Nicholas in the United States Senate in 1804, where he became at once the leading spokesman of his party. He was one of the leaders in pressing the impeachment of Justice Chase (see CHASE, SAMUEL), but voted for his acquittal on a majority of the charges, thus causing a breach which was never healed between himself and John Randolph, the principal manager of the impeachment trial on the part of the House. On the collapse of the Burr conspiracy in 1807, Giles introduced a bill for the suspension of the writ of *habeas corpus*. He secured its passage in the Senate, but it was defeated, through the influence of Randolph, in the House. Another bill introduced by him, which defined treason and provided severe penalties, was superseded in the House by a milder bill of Randolph's. In December, 1808, he introduced his bill for the strict enforcement of the

embargo, which was intended by the severity of its provisions to break down the embargo entirely. From 1809 to 1815 Giles was active in the factional fights within his party, and, with Samuel Smith and Vice-President George Clinton, formed the cabal that eventually drove Gallatin from the Cabinet, hampered the Madison Administration by forcing upon it Robert Smith as Secretary of State, and by opposing its war policy and aiding the Federalists almost disrupted the Union itself. Nevertheless, he was made chairman of the Senate Committee on Foreign Relations in 1811, in which position he was able to force upon Madison several military measures of his own. Being absolutely discredited as a party leader, and distrusted by his colleagues, he resigned his seat in the Senate in 1815. He lived in retirement until 1825, when he was an unsuccessful candidate for the Senate against John Randolph; but two years later (1827) he became Governor of Virginia, and held office until shortly before his death.

GILFIL, gil'fil, Rev. MAYNARD. The hero of George Eliot's *Mr. Gilfil's Love-Story*; a sturdy old country parson who, after a great love and a bitter sorrow in his youth, became a sarcastic, careless, but still kindly old man.

GILFILLAN, gil-fil'an, GEORGE (1813-78). A Scottish critic and essayist. He was born at Comrie, a village in Perthshire, January 30, 1813. Educated at the University of Glasgow and at the Divinity Hall of the Secession Body (afterwards the United Presbyterian Church), he was ordained, in 1836, to the School Wynd Church, Dundee, where he remained till his death, August 13, 1878. His works, in which he displayed wide literary sympathies, are numerous. Among them are: *A Gallery of Literary Portraits* (3 series, 1845, 1850, 1854); *The Bards of the Bible* (1850); *The Martyrs of the Covenant* (1852); *History of a Man*, in part autobiographical (1851); *Night: A Poem* (1867); lives of Scott (1870) and of Burns (1879); and an edition of the *British Poets* (1853-60). He did much to promote popular education, and was a successful lecturer.

GILFLORY, gil-flō'ri, Mrs. GENERAL. A humorous character in Woolf's play *The Mighty Dollar*; a widow, good-tempered, but fiery on occasion, and with a weakness for bad French.

GILGAL, gil'gāl (Heb., circle, referring to the circle of stones marking a sacred spot). The name of three towns mentioned in the Bible. The first and most important was situated to the east of Jericho (Josh. iv. 19), on the border between Judah and Benjamin. It was here that the Israelites first encamped after crossing the Jordan, and appears to have been the headquarters during the war for the conquest of the land (Josh. iv. sqq.). Probably, also this was the Gilgal which appears in the history of Samuel and Saul, and the place where the latter was made King (I. Sam. xi. 14, 15). It has been identified with the modern Birket Jiljulieh. A second Gilgal is referred to in the story of Elijah and Elisha (II. Kings ii. 1; iv. 38). It was not far from Bethel. A third Gilgal occurs in Josh. xii. 23, and perhaps is identical with Jiljulieh, about 30 miles southeast of Tantura.

GILGAMESH, gil'gā-mēsh. The name of the hero in a Babylonian epic, large portions of

which have now been found among the cuneiform tablets constituting the 'brick' library of King Asurbanipal. At first the name of the hero, written ideographically, was provisionally read Izdubar (or Gishdubar), which simply represented the sound of the three signs *iz* (or *gish*), *du*, and *bar*, with which the name was written. The phonetic reading Gilgamesh was discovered by T. G. Pinches in 1890. The Gilgamesh epic consisted originally of twelve tablets, and comprised about three thousand lines. About half of it has been recovered. The epic is a composite production, many of the stories told about Gilgamesh being attached to him merely because he became the favorite hero of the Babylonians, whose adventures acquired great popularity. In the Gilgamesh epic dimmed historical traditions and pure myth are represented in about equal proportions. He is a deified hero. As a hero he is primarily associated with the South Babylonian city Uruk (modern Warka), which he conquers; as a god he is a solar deity who is introduced in incantations and hymns. Gilgamesh is a hero of irresistible strength, and among his adventures is a fight against a tyrant, Khunbaba, who is represented as dwelling in a fortress situated in a grove of wonderful grandeur. This adventure probably recalls some historical event, but in the sixth tablet a mythical element is introduced. Ishtar, the goddess of fertility, has become enamored of Gilgamesh, and offers herself to the hero, who, however, refuses her, and adds insult to injury by reprimanding the goddess for her cruelty to her former lovers. As a punishment, a mighty bull is sent out by Anu, the god of heaven, to kill Gilgamesh, but the latter successfully vanquishes the bull. Thereupon Gilgamesh is smitten with disease and begins a long series of wanderings in search of healing. This disease represents the decline of the year, when the sun (Gilgamesh), removing itself from the earth (Ishtar), is imagined to be deprived of its former strength. Associated with Gilgamesh is another hero, Eabani—a Babylonian prototype of the first man—of whom, likewise, stories were current, some of which were transferred to Gilgamesh. Eabani and Gilgamesh become associates, and the former is also punished by Ishtar and eventually dies, whereas Gilgamesh ultimately finds a remedy that at least partially restores him. In the course of his wanderings he has many adventures. He passes through dangerous regions, encounters scorpion-men and lions before he reaches an ancestor, Pir-napishtim (source of life), who has survived a destructive deluge, and from whom Gilgamesh hopes to learn the secret of eternal life, and also to obtain healing from disease. When he at last encounters Pir-napishtim, the latter tells him the story of the deluge (q.v.), and while Gilgamesh does not learn the secret of immortality, he is healed of his disease and returns to Uruk.

It was formerly supposed that Gilgamesh was the counterpart of the biblical Nimrod, but this theory has now been abandoned. Gilgamesh bears a certain relationship to Samson, and phases of the Gilgamesh epic seem to have passed on to the Greeks and to have been embodied in the Hercules epic. Again, in the legends which cluster in the Orient around Alexander the Great, certain elements have been introduced which can be traced back ultimately to the Babylonian tales of Gilgamesh. Consult: Haupt, *Das babylonische*

Nimrodepos (Leipzig, 1884-92); Jeremias, *Izdu-bar-Nimrod* (ib., 1891); Meissner, *Alexander und Gilgamesh* (ib., 1894); Jastrow, *Religion of Babylonia and Assyria* (Boston, 1898); Jensen, *Keilschriftliche Bibliothek*, vol. vi., 1 (Berlin, 1900).

GILIA (Neo-Lat., named in honor of Felipe Gil, a Spanish botanist). A genus of about 100 species of annual or biennial and a few perennial herbs (mostly western) of the natural order Polemoniaceæ. The species have small, many-colored funnel-shaped or bell-shaped or sometimes salver-shaped five-lobed corollas, and some of the species have become popular in gardens, for which purpose they are well adapted, since they are hardy, prolific of bloom, sturdy, and of simplest culture. The seed is sown in any good soil, usually where the plants are to remain. *Gilia tricolor* is shown on Plate of CALIFORNIA FLORA.

GILIAKS, gil'ŭ-aks. A people of the northern portion of the island of Saghalien, and the coast and lowlands about the mouth of the Amur and Liman. They number some 4500, and are divided into three tribes, with at least two chief dialects. Physically they seem to be a mixed people, one type found among them resembling more the Aino, the other the Tungus; but generally they are brachycephalic, of average height, and well built. Their marriage regulations and their bear festivals are of great interest. The Giliaks, who are a hunting and fishing folk, have been influenced in their house-building and domestic arrangements by the Russians, and in their ornamentation by the Chinese. Brinton (1890) classes them with the Tchuktchis, Koriaks, Kamchatkans, etc.; but Sternberg, who lived several years in this part of Asia, and Laufer, incline to place them as a people apart from all others, in respect of language in particular. Some include them in the so-called 'Paleo-Asiatics.' The Giliaks possess a canoe of the monitor form, which resembles that of the Kootenay Indians of British Columbia. The Amur and the Kootenay rivers are the only regions of the globe where this type is found. Besides the article of Deniker on the Giliaks in the *Revue d'Ethnographie* (Paris), for 1884, the literature about them embraces: Schrenck, "Die Völker des Amurlandes," vol. iii. of his *Reisen und Forschungen in Amurland, 1854-56* (Saint Petersburg, 1881-91); Laufer, "Explorations Among the Amoor Tribes," in *American Anthropologist* (New York) for 1900; and the researches of Sternberg, résumé by Weinstein in the *Verhandlungen der Berliner Gesellschaft für Anthropologie* for 1901.

GILL, gil, or **BRANCHIA**, brāŭ'ki-ā (from Dan. *gjælle*, gill, Icel. *gjöllnar*, gills; connected with Icel. *gil*, Eng. *gill*, ravine). One of the special respiratory paired organs of animals which breathe oxygen dissolved in water. The lowest animals respire directly through the thin body-wall at all parts of the surface, and consequently require no special respiratory organs. In the higher animals, such as the mollusks, the body has become of great size, and has a thick skin for protection, and the skin is often covered by a secreted cuticula or a shell. Under these circumstances, oxygen cannot be taken in at all parts of the body, and there must be special organs for respiration, the essential feature of which is that they shall have a delicate, permeable wall.

The gills are such organs. The gills are, almost without exception, outgrowths of the body-wall, provided with a thin wall, and bathed by water. They contain blood-spaces or blood-vessels, which carry the oxygen from the gills to the tissues, and probably carry carbonic acid back to the gills to be excreted there. All gills, therefore, are physiologically alike, but they are not all homologous. We cannot consequently describe them all from one point of view, but shall have to consider them by classes. Gills have arisen independently in at least four different phyla. And even inside a single phylum the gills are by no means all related. We shall consider in order the gills of worms, mollusks, echinoderms, annelids, arthropods, and chordates.

WORMS, BRACHIOPODS, ETC. The flatworms, roundworms, and rotifers respire over the whole surface of the body; but in the Polyzoa and Brachiopoda, in which the body is more or less incased in a shell, the tentacles, taken together, form a respiratory organ, and may be spoken of collectively as gills. The tentacles are thin-walled and hollow, and their cavities communicate with the general body-cavity, so that the body-lymph may carry oxygen from the gills to the tissues.

MOLLUSKS. These massive animals have to solve a much harder problem in respiration than have the Scolecida. In the lamellibranchiates the foot is surrounded by a double row of tentacles. These remain as distinct straight filaments in a few genera, such as *Nucula*, *Leda*, *Yoldia*, and *Solenomya*; but each filament is reflected, making a knee-bend, so that each series of filaments or 'gills' is double, as in *Anomia*, *Arca*, and the mussels (*Mytilidæ*). The reflected part of each filament may be united with the basal part, and the free end of the reflected filament may grow fast to the body or to the mantle. In the other lamellibranchs the adjacent filaments are united by cross-bars, forming a sort of network. Each filament and connecting bar is hollow; blood courses through it, and receives oxygen from the water that rushes by it on all sides. The mechanism for bringing the water to the gills is simple—water rushes into the mantle-chamber, bathing the gills and penetrating between the filaments as it goes in and out. In the shelled gastropods there is a pair of gills on the right and left of the neck in a few symmetrical species; but in most of the spirally coiled species there is only one gill, and that is on the left side. The gill consists of a finger-like process containing a vessel carrying blood to the tip of the gill, and one carrying it from the gill. In passing from the first to the second vessel, the blood is spread out over numerous thin-walled plates, where it comes in contact with the water. In the naked gastropods respiration occurs chiefly on the whole surface of the body, but sometimes by special finger-like outgrowths. In cephalopods there are either two or four gills, which lie in the mantle-cavity, projecting forward, and are fastened on both sides. The general arrangement is the same as in the gastropod gill, but the capillary absorbing surfaces are much increased in area.

ECHINODERMS. The respiratory organs in the group of echinoderms are not all homologous; for the most part they have the function, as it were, by accident. In the starfishes parts of the outer skin are raised up to form thin-walled

papillæ, which are believed to be respiratory. In the serpent-stars the thin-walled pouches lying next the arms in which the sexual products are thrown serve also for respiration. In the sea-urchins there is a gill at the base of each interradius on the outer edge of the thin membrane about the mouth. The gill is merely a thin-walled sac of the skin, into which the body fluids can flow. In the sea-cucumbers (Holothuroidea) there are special, complicated respiratory organs called the respiratory trees. They arise from the lower end of the food-canal, as great branched sacs extending up into the body-cavity. Water flows into these 'trees' and out of them at regular intervals. The 'trees' are wanting in a few thin-walled sea-cucumbers, such as *Synapta* and a pelagic and a deep-sea form.

ANNELIDS AND ARTHROPODS. The thick-skinned fresh-water annelids need no gills, but the thick-skinned marine ones have usually some special provision for respiration. The swimming feet often have a thin, broad lobe containing blood-vessels, and in a few annelids there are special filiform or branched outgrowths of the feet, which aid in respiration. Since the Crustacea are thick-skinned, nearly all of them have gills. In the lower Crustacea there are respiratory plates (podobranchiæ) attached to the legs, but in the higher forms these leg organs form pyramidal masses with central efferent and afferent vessels leading to and from the hundreds of delicate papillæ of which the gill is composed. The gills are so placed that the blood leaving them goes directly to the heart. The great gills are covered by a special shield, the carapace.

In the merostomes (king-crabs, etc.), the gills are broad, flat, and rounded sacs, like the leaves of a book, forming a file of upward of a hundred on each of the gill-bearing abdominal legs. In the trilobites the gills form triangular expansions of certain of the segments of many of the legs behind the head.

INSECTS. The gills of insects whose nymphs or larvæ are aquatic are called 'tracheal' gills, because they are permeated by fine air-tubes; they are long or flattened, leaf-like filaments attached to the sides or end of the body. Such are the gills of the larvæ of the caddis-flies, and of certain aquatic caterpillars (Paraponyx); those of the nymphs of May flies are broad and leaf-like. In the highly modified nymphs of certain May flies (*Bætica* and *Prosopistoma*), the dense masses of tracheal gills are entirely concealed and protected by projections of the mesothoracic segment, so as to form a true respiratory chamber, to which the water gains access by minute openings. Blood-gills are described by Fritz Müller as certain delicate and tubular processes, into which the blood flows, and which do not contain tracheæ. Müller compares them with the gills of Crustacea; they occur in case-worms. The larva of *Pelotrus*, a beetle, has true blood gills. A few adult insects (*Pteronarcys*, and other *Perlidae*) have tracheal gills arising in tufts on the under side of the thorax. In a dragon-fly (*Euphæa*) the gills of the nymph are retained in the imago. The nymphs of many dragon-flies breathe by rectal gills. Consult Packard, *Text-book of Entomology* (New York, 1898).

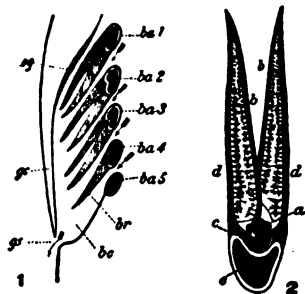
CHORDATA. Gills in this group are at least roughly homologous. In all the lower aquatic forms water is taken into the mouth, and forced

out through slits in the neck. The sides of these slits, when the current is strongest, are beset with filaments in which the blood circulates and receives oxygen. The gills may be covered, as in most fishes; or they may stand out from the sides of the body, as is the case in gilled Amphibia. The latter position is a precarious one, for the gills are often bitten off; but they can be quickly regenerated. See ALIMENTARY SYSTEM, EVOLUTION OF; RESPIRATORY SYSTEM, COMPARATIVE ANATOMY OF THE.

FISHES. The following remarks are condensed from Professor Owen's *Anatomy of the Vertebrates* (London, 1866-68). In the Cyclostomi, which, if we except the lancelet, constitute the lowest order of fishes, and include the hag and lamprey, the gills are saciform, with external openings, and six or seven in number on each side. Each gill-sac receives its proper artery either from the branchial artery or one of its branches. "The leading condition of the gills in other fishes may be understood," says Owen, "by supposing each compressed sac of a myxine to be split through its plane, and each half to be glued by its outer smooth side to an intermediate septum, which would then support the opposite halves of two distinct sacs, and expose their vascular mucous membrane to view. If the septum be attached by its entire margin, the condition of the gill in the Plagiostomi (sharks, dogfish, rays, skates, etc.) is effected. If the septum be liberated at the outer part of its circumference, and the vascular surfaces are produced into pectinated lamelligerous processes, tufts, or filaments proceeding from the free arch, the gill of an ordinary osseous fish is formed. Such a gill is the homologue, not of a single gill-sac, but of the contiguous halves of two distinct gill-sacs, in the myxines: Already in the lampreys the first stage of this bi-partition may be seen, and the next stage in the sharks and rays; consequently, in these fishes a different artery goes to the anterior branchial surface of each sac or fissure from that which supplies the posterior branchial surface of the same fissure; while one branchial artery is appropriated to each supporting septum or arch between the fissures, as it is to the liberated septum or branchial arch in the ordinary osseous fishes."

The lampreys, myxinoids, sharks, and rays are termed fishes with 'fixed gills,' because in them each supporting septum of the anterior and posterior branchial mucous surfaces is attached to the pharyngeal and dermal integument by its entire outer margin, and the streams of water flow out by the same number of fissures in the skin as those by which they enter from the pharynx. In the osseous and in the ganoid fishes there are 'free gills,' the outer border of the supporting branchial arch being unattached to the skin, and playing freely backward and forward, with its gill-surfaces, in a common gill-cavity, which has a single outlet, usually in the form of a vertical fissure. In the myxinoids (see illustration under HAGFISH) six or seven branchial sacs open on each side, and their outlets are produced into short tubes, which open into a longitudinal canal, directed backward and discharging its contents by an orifice near the middle line of the ventral surface. Between the two outlets is a third larger one, which communicates by a short duct with the end of the œsophagus, and admits the water, which passes from that tube

by the lateral orifices leading into the branchial sacs. These sacs, which are developed from the œsophagus, and which may be regarded as the simplest form of piscine gill, have a highly

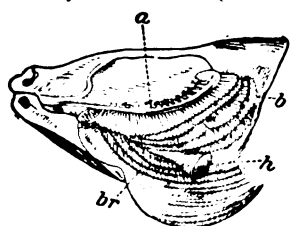


ARRANGEMENT OF A FISH'S GILLS.

Fig. 1. Diagram to show the arrangement of the gills in a bony fish, as seen in a horizontal section of the branchial chamber on one side. *gc*, gill-cover; *gs*, gill-slit; *bc*, common branchial chamber; *ba 1* to *ba 4*; first four gill-bearing branchial arches, the first three having a double series of branchial laminae, the fourth having only a single series; *ba 5*, rudimentary fifth branchial arch ('inferior pharyngeal' bone), which carries no gills; *og*, pseudo-branchia or 'opercular gill,' developed on the inner face of the gill-cover. The arrows show the passage of the water through the branchial fissures and out by the gill-slit. Fig. 2. Diagram of a pair of branchial laminae in a bony fish. *e*, branchial arch transversely divided, showing the external groove in which the great vessels run; *a*, branchial artery, giving off branches (*bb*) along the inner edges of the branchial laminae; *c*, branchial vein, receiving branches (*dd*) from the outer edges of the branchial laminae.

vascular, but not a ciliated, mucous membrane, which is arranged in radiating primary and secondary folds, so as to increase the surface. In the lampreys there is a further separation of the respiratory from the digestive tract, for each internal blind duct communicates with a median canal beneath and distinct from the œsophagus.

In all the higher fishes the inlets to the branchial interspaces lie on each side of the gullet, and are equal in number with the interspaces; while, except in the elasmobranchs, there is only one outlet on each side. These outlets vary extremely in size, being relatively largest in the



GILLS OF A PERCH.

Gills and heart of the perch, exposed by the removal of the gill-cover on the left side. *a*, first of the four bony arches which carry the gills (*b br*); *br*, lower edges of the gills on the right side; *b*, heart.

is smallest, as in the eels, blennies, and lophioids, and these are the fishes that survive the longest out of water, except in such cases as the climbing fish (q.v.), in which the branchial apparatus possesses complex labyrinthine appendages. The main object of the gills of fishes being to expose the venous blood, in very thin-walled vessels, to streams of water, the branchial arteries rapidly subdivide into capillaries, which constitute a network in one layer,

supported by an elastic plate, and covered by a tessellated but non-ciliated epithelium. This covering and the capillary wall are so thin as to admit free interchange to take place between the blood, loaded with carbonic acid, on the one hand, and the aerated water on the other. The extent of respiratory surface is increased in various ways, of which by far the most common is "by the production of the capillary-supporting plates from each side of long, compressed, slender, pointed processes, extending, like the teeth of a comb, but in a double row, from the convex side of each branchial arch." The number of vascular plates or lamellae attached to each branchial process has been estimated at 135 in the carp, 700 in the eel, 1000 in the cod, 1400 in the salmon, and 1600 in the sturgeon.

AMPHIBIA. We now pass on to the consideration of these organs in amphibians. In the lower or perennibranchiate members of this order, the gills exist permanently, but in the great majority they are mere temporary organs. In the newt three pairs of external gills are developed, at first as simple filaments, each with a capillary loop, but speedily expanding and giving off looplets. The gill is covered with ciliated epithelium, which loses the cilia before the absorption of the organ, and this takes place after a few days of larval existence. In the larval frog the gills, which are on a simpler plan, diminish about the fourth day, and disappear on the seventh. The parts of the branchial framework which support the deciduous gills never get beyond the cartilaginous stage. They thus readily shrink, and become more internal as the head increases in size. As the gills of the perennibranchiate amphibians in all essential points resemble those already described, it is unnecessary to notice them. See AMPHIBIA; DIPNOI.

GILL, gil, Sir DAVID (1843—). A Scottish astronomer, born in Aberdeenshire. He studied at the University of Aberdeen, and in 1873-76 was director of the private observatory of the Earl of Crawford (then Lord Lindsay) at Dun Echt (Aberdeenshire), in which capacity he organized the transit of Venus expedition sent by Lord Lindsay to Mauritius. In 1877 he organized and conducted an expedition to the Ascension Islands for the purpose of determining the solar parallax through observation of Mars. For the results of this expedition he was awarded the gold medal of the Royal Astronomical Society, and the Valz prize at the Académie des Sciences of the Institut de France. In 1885-96 he executed the geodetic survey of Natal and Cape Colony, and in 1897 organized the geodetic survey of Rhodesia. He was made in 1900 Watson gold medalist of the National Academy of Sciences, Washington, D. C. He urged the desirability of the use of photography in the preparation of catalogues of the stars, and himself photographed the great comet of 1882. His writings include memoirs on *Heliumeter Determinations of Stellar Parallax in the Southern Hemisphere* (in the *Memoirs of the Royal Astronomical Society*, vol. xlviii., 1884), and *A Determination of the Solar Parallax from Observations of Mars at the Island of Ascension* (ib., vol. xlvii., 1881).

GILL, HARRY. See GOODY BLAKE.

GILL, JOHN (1697-1771). A Baptist minister, distinguished for his knowledge of rabbinic literature. He was born at Kettering, North-

amptonshire, November 23, 1697. He spent a short time at Kettering Grammar School, and continued his studies in private. At an early age he began to preach, and was ordained in 1718. In 1719 he became pastor of a Baptist church at Horselydown, in Southwark; in 1757 he removed to a new chapel in Camberwell, near London Bridge, where he remained till his death, October 14, 1771. Gill was a very voluminous author. His greatest work was his *Exposition of the Holy Scriptures* (New Testament, 1746-48; Old Testament, 1748-63). He also wrote a *Dissertation on the Antiquity of the Hebrew Language, Letters, Vowel Points, and Accents* (1767), and many controversial works of merely temporary interest. He was a strong Calvinist. Consult his memoir by Ripon (London, 1816).

GILL, zhél, LOUIS ALEXANDRE GOSSET DE GUINNES (called André) (1840-85). A French illustrator, born in Paris. His first work appeared in *La Lune*, and afterwards appeared in *L'Eclipse*. He excelled in the caricature of portraiture, and the best known of his drawings are the series of "Our Contemporaries" and "Our Deputies." His pictures have been shown at the Salon, his dramas have been played, and his verses have often been reprinted; but it is as a caricaturist of contemporary politics that Gill achieved and maintained his reputation.

GILL, THEODORE NICHOLAS (1837-). An American zoölogist, born in New York, N. Y. In 1865-67 he was librarian of the Smithsonian Institution, in 1866-75 assistant librarian of the Library of Congress, and in 1884 became professor of zoölogy in Columbia University. He was elected a member of the National Academy of Sciences, was appointed an associate in zoölogy in the United States National Museum, and in 1897 was elected president of the American Association for the Advancement of Science. His writings, chiefly on ichthyology, include: *Synopsis of Fresh Water Fishes* (1861); *Arrangement of the Families of Mollusks* (1871); *Catalogue of the Fishes of the East Coast of North America* (1873; part i. of the Report for 1871-72 of the United States Commission of Fish and Fisheries); *Bibliography of the Fishes of the Pacific Coast of the United States to the End of 1879* (1882); *Principles of Geography* (1884); *The Characteristics of the Family of Scatophagoid Fishes* (1891); and *Notes on the Tetradontoidea* (1892). He also prepared with Elliott Coues *Material for a Bibliography of North American Mammals* (1877; in vol. xi. of Hayden, *Report of the United States Geological Survey of the Territories*).

GILL, WILLIAM JOHN (1843-81). An English military engineer and traveler, born at Bangalore, India. He studied at Brighton College and the Royal Military Academy (Woolwich), in 1864 was commissioned a second lieutenant in the Royal Engineers, and in 1869-71 served in India. From 1871 to 1876 he was in England, on duty at Aldershot, Chatham, and Woolwich. In 1874 he contested Hackney, and in 1880 Nottingham, both successfully. His first experience as a traveler was had in 1873, when he accompanied Colonel Valentine Baker in a journey through Persia, during which he executed a survey which contributed much to geography. In 1876 he was transferred to Hong Kong, and in 1876-78 traveled in China and Tibet. For the results of this

journey, comprised principally in a large map and in a memoir published in the *Journal of the Royal Geographical Society*, he obtained the gold medal of that society (1879), and that of the Paris Geographical Society (1880). In 1879 he was appointed assistant boundary commissioner on the boundary between Russia and Turkey, newly established by the Berlin treaty. He was in Egypt in 1881 on special service, and having been sent to cut the telegraph wire which led from Cairo across the desert to Syria, was murdered by Bedouins at Wady Sahr. He published *The River of Golden Sand* (2 vols., 1880); new ed. 1883), a popular account of his journey in Tibet and China.

GILLE, zhél, PHILIPPE EMILE FRANÇOIS (1831-1901). A French dramatist and author, born in Paris. At first he studied sculpture; then he became secretary of the Lyric Theatre (1861). He was on the staff of several Parisian journals, notably the *Figaro*, for which he began in 1869 to write the bibliographical criticisms. Some of these have been collected under the title *La bataille littéraire* (1869-91). He also wrote a number of librettos and ballets and several comedies, such as *Vent du Soir* (1857; music by Offenbach); *Le bœuf Apis* (1865, music by Delibes); *Les charbonniers* (1877); *Yedda*, a ballet (music by Métra); *Nanon* (1884, music by Massenet); the book of *Clarissa Harlowe* for Bizet, who died before completing the opera, and *Camille* (1890). He published a volume of poems *L'herbier* (1887), and *Mémoires d'un journaliste* (1869-76).

GILLEM, gíl'lēm, ALVAN CULLEM (1830-75). An American soldier, born in Jackson County, Tenn. In 1851 he graduated at the United States Military Academy, in 1851-52 served against the Seminole Indians, and during the Civil War was chief quartermaster of the Army of the Ohio in the Tennessee campaign, was appointed colonel of the Tenth Tennessee Volunteers in 1862, and from 1863 until the close of the war, with rank of brigadier-general of volunteers, was active in Tennessee, frequently as commander in expeditions or engagements. For bravery at Marion, Va., he was brevetted colonel, United States Army. At the reorganization of the Tennessee State Government toward the close of the war he was vice-president of the convention (January 9, 1865) for the revision of the Constitution, and sat in the first Legislature elected thereafter. Brevetted major-general, United States Army, and commissioned colonel, United States Army, he was in command of the District of Mississippi in 1867-68, and was prominent in the operations against the Modoc Indians in 1873.

GILLE/NIA (Neo-Lat., named in honor of Arnold Gill, a German botanist). A genus of perennial plants of the order Rosaceæ, natives of the temperate parts of Eastern North America. The roots are used in medicine as a mild emetic, and in small doses as a tonic. There are two species which are often called Indian physic. *Gil- lenia trifoliata*, American ipecac, Indian hippo, dropwort, and *Gillenia stipulacea*, or bowman's root. The plants of this genus grow to a height of about two feet, and on account of their graceful foliage are often planted in shrubberies.

GILLESPIE, gíl-lēs'pí, ELIZA MARIA (known also by her religious name, 'Mother Mary of Saint Angela') (1824-87). After a conventual education at Somerset, Ohio, and Georgetown,

D. C., she entered the Congregation of the Holy Cross (1853), and in 1855 became mother superior of the Academy of Saint Mary, then at Bertrand, Mich., but afterwards removed by her to Saint Mary's, Ind. It is said that she founded not far from thirty academies in various parts of the United States. At the beginning of the Civil War she organized among the sisters a board of hospital nurses, which, with the centre of work at Cairo, Ill., rendered effective service in the care of wounded and sick. Upon the separation of her Order in the United States from the European body, she became mother superior.

GILLESPIE, GEORGE (1613-48). A Scotch Presbyterian clergyman and prominent member of the Westminster Assembly. He was born at Kirkcaldy, near Leith, January 21, 1613. After a brilliant career as a student at the Saint Andrews University he became domestic chaplain to Lord Kenmure, and in 1634 to the Earl of Cassilis, his conscience not permitting him to accept the episcopal ordination which was at that time in Scotland an indispensable condition of induction to a parish. While with the Earl of Cassilis he wrote his first work, *A Dispute Against the English Popish Ceremonies Obtruded upon the Church of Scotland* (1637), which attracted considerable attention, and within a few months all available copies were called in and burned by order of the Privy Council. In April, 1638, soon after the authority of the bishops had been set aside by the nation, Gillespie was ordained minister of Wemyss (Fife) by the Presbytery of Kirkcaldy, and in the same year preached a sermon before the General Assembly at Glasgow, pronouncing so decidedly against royal interference in matters ecclesiastical as to call for remonstrance on the part of the Earl of Argyll, then Lord High Commissioner. In 1642 Gillespie was transferred to Edinburgh; but the brief remainder of his life was chiefly spent in London. Already, in 1640, he had accompanied the commissioners of the peace to England as one of their chaplains; and in 1643 he was appointed to the Westminster Assembly. Here he took a prominent part in almost all of the protracted discussions on Church government, discipline, and worship, supporting Presbyterianism by numerous controversial writings, as well as by an unusual fluency and readiness in debate. He died at Kirkcaldy December 16, 1648. His works were published in Edinburgh (1843-48) with prefatory memoir by Hetherington.

GILLESPIE, GEORGE DE NORMANDIE (1819—). A Protestant Episcopal bishop, born in Goshen, N. Y. He graduated at the General Theological Seminary, New York City, in 1840, and was ordained priest in 1843. He was rector of Saint Mark's Church, Leroy, N. Y. (1841), Saint Paul's Church, Cincinnati (1845), of Zion Church, Palmyra, N. Y. (1851), and of Saint Andrews Church, Ann Arbor, Mich. (1861). In 1875 he was consecrated Bishop of the Diocese of Western Michigan, and in 1877 he became a member of the State Board of Charities and Correction. His published writings include: *The Communion of Saints*; *An Holy Priesthood*; and *The Season of Lent*.

GILLESPIE, WILLIAM MITCHELL (1816-68). An American author, born in New York City. He graduated at Columbia in 1834, and from

1845 was professor of civil engineering in Union College. A forceful and profound scholar, he wrote: *Rome as Seen by a New Yorker* (1845); *The Principles and Practice of Land-Surveying* (1855; 6th ed. 1858); a posthumously published *Treatise on Traveling, Topography, and Higher Surveying* (1871; edited by Staley); and other works.

GILLETT, JIL-LÈT', EZRA HALL (1823-75). An American clergyman and author, born at Colchester (New London County), Conn. He graduated in 1841 at Yale, and in 1844 at the Union Theological Seminary, and from the latter year was pastor of the Presbyterian Church at Harlem, N. Y. In 1868 he was appointed professor of political economy, ethics, and history in New York University. In addition to numerous contributions to theological reviews, he published the *Life and Times of John Huss* (1863-64); a *History of the Presbyterian Church in the United States* (1864; 2d ed. 1875); *The Moral System* (1875); and other works.

GILLETTE, WILLIAM HOOKER (1855—). An American actor and playwright. The son of United States Senator Francis Gillette, of Connecticut, he was born in Hartford, Conn., and studied in the universities of New York and Boston, while applying himself to the theatre. He met with success as an actor in stock companies in the South and West, as well as in Boston and New York, and has written a number of plays of great popularity, to the presenting of which he has in recent years devoted himself on the stage. Among them are *Digby's Secretary* (1884, an adaptation from the German, which was, by compromise, combined with Charles Hawtrey's play, *The Private Secretary*, from the same source); *Esmeralda* (in which he collaborated with Mrs. Burnett); *Held by the Enemy*; *A Legal Wreck*; *Too Much Johnson*; and *Secret Service*. His latest New York success was in his dramatization of Sir Conan Doyle's *Sherlock Holmes*, afterwards presented in London. Consult: Hapgood, *The Stage in America, 1897-1900* (New York, 1901); Strang, *Famous Actors of the Day in America* (Boston, 1900); Clapp and Edgett, *Players of the Present* (New York, 1899).

GILLIE, gill'li (Gael., Ir. *giolla*, lad, man-servant). A Highland attendant; a boy, page, or menial; an outdoor servant, especially one in attendance on persons engaged in hunting or traveling. Formerly, in Scotland, it was the duty of a servant, called a *gillie white-foot* or *gillie web-foot*, to carry his master over brooks or watery places.

GILLIES, gill'iz, JOHN (1747-1836). A Scottish historian and classical scholar. He was born in Forfarshire, and was graduated at Glasgow University. A literary life in London was interrupted for a time by travels on the Continent, when he was tutor to the sons of John, Earl of Hopetoun. In 1793 Gillies was appointed royal historiographer for Scotland. His *History of Greece* (1786), long superseded, was his most popular work. He also wrote *A History of the World* (from Alexander the Great to Augustus, 1807) and published the translations *Orations of Lysias and Isocrates* (1778), *Aristotle's Ethics and Politics* (1797), and *Aristotle's Rhetoric* (1823).

GILLINGHAM, gill'ing-hām. A town in Kent, England, one mile east-northeast of Chat-

ham (Map: England, G 5). It is the centre of a fruit-growing district noted for its cherries. It has interesting archaeological remains. Gillingham fort was built in the reign of Charles I. The Jezreelites, or the New and Latter House of Israel, have a large temple and school at Gillingham, which is their headquarters. Population, in 1891, 27,800; in 1901, 38,900.

GILLIS LAND. A territory in the Arctic regions supposed to be situated in about latitude 81° N. and longitude 36° or 42° E. (Map: Arctic Regions, G 4). It was first sighted by the Dutch navigator Gillis in 1707, and, although many other explorers have claimed to have seen it, it has never been explored.

GILLISS, gil'is, JAMES MELVILLE (1811-65). An American astronomer, born in Georgetown, D. C. He became a midshipman in the navy in 1827. He procured leave of absence in 1833, spent a year in scientific study at the University of Virginia, and continued his studies in Paris. Returning to the United States, he became in 1836 assistant in the Bureau of Charts and Instruments in Washington, and two years later, in a small wooden building belonging to the Navy Department, organized the first working observatory in the United States. He was made a lieutenant in 1838, and for five years conducted at Washington astronomical observations of great value, which were published by the Government in 1846, containing the first catalogue of stars, and being the first report of astronomical observations to be published in America. In 1842-43 he visited Europe to procure the equipment for the new Government observatory at Washington, completed under his direction in 1845. He spent the years 1849-52 in Chile, where he made observations for the determination of the solar parallax, and studied the constellations of the Southern Hemisphere. He observed solar eclipses in 1853 in Peru, and in 1860 on the northern Pacific coast of the United States, and after the departure of Lieut. M. F. Maury at the outbreak of the war, succeeded him as superintendent of the National Observatory at Washington, a position which he held until his death. Under his control the observatory became one of the best equipped in the world. He became a captain in 1862. His publications include: *Astronomical Observations Made at the Naval Observatory* (1846); *The United States Astronomical Expedition to the Southern Hemisphere, 1849-52* (1855). Consult Gould, *Memoir*.

GILLMORE, gil'môr, QUINCY ADAMS (1825-88). An American soldier and eminent military engineer, born at Black River, Lorain County, Ohio. He graduated at West Point, as first in his class in 1849, and was assigned to the Engineer Corps, served as an assistant engineer in the building of Fortress Monroe from 1849 to 1852, and from 1852 to 1856 was assistant instructor of practical military engineering at West Point, where he also acted as treasurer and quartermaster from September, 1855, to September, 1856. From 1856 to 1861 he was stationed at New York, where he was in charge of the Engineer Agency intrusted with the buying and the shipping of materials for fortifications, and in 1857-58 was also in charge of the fortifications in New York harbor. During the Civil War he was one of the ablest military engineers in the Federal service.

He acted as chief engineer of the Port Royal Expeditionary Corps in 1861-62; was chief engineer at the siege of Fort Pulaski, Ga.; from February to April, 1862, was in command during the bombardment and capture of that fort; and on April 28, 1862, was raised to the rank of brigadier-general of volunteers. He then commanded successively the District of Western Virginia (from September 28 to October 14, 1862), the First Division of the Army of Kentucky (October 14, 1862, to January 25, 1863), and the District of Central Kentucky (January 25, to April, 1863), and on March 30, 1863, was brevetted colonel in the Regular Army. From June 12, 1863, to April, 1864, he was in command of the Department of the South, and from July 16, 1863, to June 17, 1864, of the Tenth Army Corps, during which time he conducted the land operations against Charleston, S. C., and participated in the battle of Drury's Bluff, Va., and in the defense of Bermuda Hundred. In July, 1864, he commanded two divisions of the Nineteenth Army Corps in the defense of Washington, and the pursuit of General Early (q.v.). On March 13, 1865, he was brevetted successively brigadier-general and major-general in the Regular Army; and on December 5, 1865, he resigned from the volunteer service. After the close of the war he served as superintending engineer of the fortifications on Staten Island from 1866 to 1869, 1870 to 1882, and 1883 to 1884; of the coast defenses from Cape Fear River, N. C., to Saint Augustine, Fla., from 1869 to 1882, and from 1883 to 1884; and was superintending engineer of surveys of rivers and harbors in North Carolina, South Carolina, Georgia, and East Florida from 1870 to 1882, and again from 1883 to 1888, during which time he was in charge of various river and harbor improvements of importance. He was president of the Mississippi River Commission from 1879 to 1882, was raised to the regular rank of colonel of engineers in February, 1883, and at various times was a member of important engineer boards. In 1876 he was one of the judges at the Centennial Exposition, and presented to the Bureau of Awards able reports on *Portland, Roman, and Other Cements and Artificial Stones*, and on *Brick-Making Machinery, Brick-Kilns, Perforated and Enameled Brick, and Pavements*. He published *Siege and Reduction of Fort Pulaski* (1862); *A Practical Treatise on Limes, Hydraulic Cements, and Mortars* (1863); *Engineering and Artillery Operations Against Charleston, S. C., in 1863* (1865; supplement 1868); *Béton, Coignet, and Other Artificial Stones* (1871); *The Compressive Strength, Specific Gravity, and Ratio of Absorption of Building Stones of the United States* (1876); and *A Practical Treatise on Roads, Streets, and Pavements* (1876).

GILLOTT, jil'ôt, JOSEPH (1800-72). An English manufacturer of steel pens. He first began the manufacture of pens in 1830, and gradually introduced improvements, both in the pen itself and in manufacturing processes, until his pens came to be almost universally used. He accumulated a large fortune, a part of which he expended in getting together a valuable collection of paintings.

GILL-OVER-THE-GROUND. See GROUND-IVY.

GILLRAY, gil'râ, JAMES (1757-1815). An English caricaturist. He was born in London, July,

1757, of Irish descent, but little is known of him until he became a student of the Royal Academy, where he made a special study of art designs. His first engraved works were two plates published in 1784; they were illustrations for Goldsmith's *Deserted Village*. In 1792 he visited France, Germany, and Holland; in the same year he published his well-known caricatures, "John Bull and His Family Landing at Boulogne," and the large plate after Northcote, inscribed "La Triomphe de la Liberté, ou l'élargissement de la Bastille." Gillray has no rival as a caricaturist of the politics and manners of the years 1774-1809. His cartoons represent the fashionable society at Vauxhall Gardens, lords and ladies, singers, soldiers, life at home, in the taverns, in the villages, and in the poor quarter of London among the patient, struggling artisans. His comedy was produced by the strongest contrasts. He was a masterly draughtsman of a vehement style, almost brutal and coarse at times, yet capable of expressing the most delicate feeling and beauty. His caricatures number twelve thousand, and his last work is dated 1811. His death, caused by intemperate habits, occurred in London, June 1, 1815. A satire on an "Irish Fortune-hunter," or "Paddy on Horseback," is the earliest known work, dated 1779; other works are: "L'Assemblée nationale" or a "Grand Co-operative Meeting at Saint Anne's Hill" (1804); "A New Way to Pay the National Debt" (1796); "Temperance Enjoying a Frugal Meal" and a "Voluptuary Under the Horrors of Digestion" (1792); "The Life of William Cobbett. Written by Himself," eight satirical plates (1809); "Elements of Skating," four plates (1805); "Rake's Progress at the University," five plates (1806). Consult: Buss, *English Graphic Satire* (London, 1874); Everitt, *English Caricaturists* (ib. 1885).

GILLS, SOLOMON. A ship's-instrument maker, in Dickens's *Dombey and Son*, and a great crony of Capt. Edward Cuttle.

GILLYFLOWER (ME. *gyllofer*, from OF. *giolfre*, *girofle*, *girofre*, corrupted from ML. *caryophyllum*, from Gk. *καρυόφυλλον*, *karyophyllum*, clove-tree, from *καρυον*, *karyon*, nut + *φύλλον*, *phyllon*, leaf; influenced by popular etymology with Eng. *flower*). A popular English name for some of the cruciferous plants, prized for the beauty and fragrance of their flowers, as wallflower, stock, etc. The clove-pink also, the wild original of the carnation, is called clove-gillyflower. The name is now used mostly for species of the genera *Cheiranthus* and *Matthiola*. Species of the former furnish the different varieties of wallflowers, and of the latter the various kinds of stock. See **STOCK**.

GILMAN, gil'man, ARTHUR (1821-82). An American architect, born at Newburyport, Mass. After his graduation at Trinity College (Hartford, Conn.), he became known as a lecturer on architecture, and as a practical architect, whose chief achievement was the Boston City Hall. From 1865 he was a resident of New York City, where he designed the building of the Equitable Insurance Company. A portion of the State Capitol at Albany, also, is his work. While a citizen of Boston, he was prominent in his endeavors for municipal improvement.

GILMAN' ARTHUR (1837—). An American educator. He was born in Alton, Ill., was educated in Saint Louis and New York, was en-

gaged in banking in New York from 1857 to 1862; and in 1862 removed to Massachusetts, where he gave his attention chiefly to education and religious instruction, and was for some years after 1871 editor of the publications of the American Tract Society. In 1876, together with his wife, he devised a scheme for the collegiate instruction of women that developed into the Harvard Annex. Mr. Gilman was the executive officer, and when in 1894 the Annex became Radcliffe College, he was chosen as its regent, a position which he held for two years. He founded, and in 1886 became the director of, the Cambridge School for girls known as the "Gilman School." Besides contributing to the magazines, he has published: *First Steps in English Literature* (1870); *Boston, Past and Present* (1873); *First Steps in General History* (1874); *Shakespeare's Morals* (1879); *History of the American People* (1883); *Tales of the Pathfinders* (1884); *The Story of the Saracens* (1886); *The Story of Rome* (1886); *The Discovery and Exploration of America* (1887); *The Making of the American Nation* (1887); and *The Story of Boston* (1889); and has edited various compilations.

GILMAN, CAROLINE HOWARD (1794-1888). An American author, born in Boston. She was the daughter of Samuel Howard, and married the Rev. Samuel Gilman. She was widely known as a writer, and some of her works enjoyed at one time a considerable popularity. Among her publications are: *Recollections of a New England Housekeeper* (1835); *Recollections of a Southern Matron* (1836); *Poetry of Traveling in the United States* (1838); *Ruth Raymond* (1840); *Verses of a Life Time* (1849); and, in conjunction with her daughter, Mrs. Jervey, *Poems and Stories by a Mother and Daughter* (1872).

GILMAN, CHANDLER ROBBINS (1802-65). An American physician. He was born in Marietta, Ohio, graduated at the University of Pennsylvania in 1824, and from 1841 until his death was professor of obstetrics and diseases of women and children in the College of Physicians and Surgeons, where, after 1851, he also filled the chair of medical jurisprudence. He published: *Life on the Lakes* (1835); *Sketch of the Life and Character of Dr. J. B. Beck* (1851); and *The Relations of the Medical to the Legal Profession* (1856).

GILMAN, DANIEL COIT (1831—). An American educator, born in Norwich, Conn. He came from a New Hampshire family which migrated from Norfolk, England, in 1638. After graduation at Yale in 1852, he studied and traveled in Europe. In 1855 he entered the service of his alma mater and remained in it until 1872, as librarian, professor of physical and political geography, and secretary of the Sheffield Scientific School. He then was made president of the University of California. In 1875 he was called to the presidency of the newly founded Johns Hopkins University of Baltimore, and retained this office for twenty-five years. After his resignation he was chosen president of the Carnegie Institution of Washington. He also served as president of many educational and philanthropic associations, and received many honorary diplomas. President Cleveland appointed him one of the commissioners to determine the true boundaries of Venezuela; he served as one of the Charter Commission of Baltimore; and was

made president of the National Civil Service Reform League, and of the American Oriental Society. As a member of three boards—the Peabody, the Slater, and the General Education Board—he became active in the promotion of education in the South. His publications include a large number of reports and magazine articles, an introduction to Lieber's minor writings, an introduction to De Tocqueville's *Democracy in America*, a volume of speeches and essays entitled *University Problems*, a small volume on *Science and Letters in Yale*, and a memoir of James Dwight Dana, the geologist. To the American Statesmen Series he contributed a memoir of President Monroe. In 1901 he became one of the three general editors of the *New International Encyclopædia*.—His brother, EDWARD WHITING (1823-1900), was born at Norwich, Conn., graduated at Yale University in 1843, and, after studying theology at the Union Theological Seminary and the Yale Divinity School, became a Congregational minister. For twenty years prior to his death he was corresponding secretary of the American Bible Society, being chiefly concerned with its wide foreign correspondence.

GILMAN, JOHN TAYLOR (1753-1828). An American political leader, Governor of New Hampshire for fourteen terms. He was born at Exeter, N. H., the son of Nicholas Gilman, a Revolutionary leader, and a brother of United States Senator Nicholas Gilman (1755-1814). He was educated at Exeter. The day following the battle of Lexington he marched to Cambridge with the first company of minute-men from New Hampshire, and subsequently served as an aide to his father, who commanded the regiment of New Hampshire troops at the siege of Boston. Later he became assistant to his father, who was Treasurer of New Hampshire from 1776 to 1783. His first political office was that of a member of the New Hampshire Legislature in 1779. He was a delegate from New Hampshire to the convention of New York and the New England States held in 1780 at Hartford, Conn., to devise means for the continuation of the war. In 1782-83 he was a member of the Continental Congress, resigning after a year's service to accept the office of Treasurer of his native State, in succession to his father. In 1786 he resigned the Treasurership to act as commissioner, with John Kean of South Carolina and William Irvine of Pennsylvania, to settle the accounts of the old Confederation with the several States. He was engaged in this work until 1791, when, after another year's service as State Treasurer, he was elected, in 1794, Governor of New Hampshire. This office he held until the close of 1805, and again from 1813 to 1816. In 1812 he was a Presidential elector on the Federalist ticket, and in 1813, in the political upheaval precipitated by the war with England, he was again chosen Governor. He was reelected in the two succeeding years, and, although opposed to the war policy of the National Government, engaged actively in providing defenses for the New Hampshire coast and frontier. He sympathized with the movement that resulted in the Hartford Convention of 1814, but refused to take any action in the matter of sending delegates from New Hampshire, which was therefore represented only unofficially. In 1816 he declined a reelection, and retired to private life. Consult *The Gilman Family* (Albany, 1869).

GILMAN, NICHOLAS (1755-1814). An American statesman, born at Exeter, N. H. He served during the Revolutionary War as adjutant in the First New Hampshire Regiment (Col. Alexander Scammell's), in 1786-88 was a member of the Continental Congress, and in 1787 of the Constitutional Convention at Philadelphia. From 1780 to 1797 he sat in the House of Representatives, and from 1805 until his death in the Senate. He was a distinguished figure in the public life of his time.

GILMAN, NICHOLAS PAINE (1849—). An American author, journalist, and clergyman, born at Quincy, Ill. He graduated at the Harvard Divinity School in 1871, was pastor of various Unitarian churches in Massachusetts from 1872 to 1878, and professor of English literature at Antioch College, Yellow Springs, Ohio, in 1878-81. In the latter year he resumed his pastoral work. From 1885 to 1889 he was assistant editor of the *Unitarian Review*, from 1889 to 1895 was editor of the *Literary World* (Boston), and in 1892 became editor of the *New World*, a Unitarian quarterly. In 1895 he was appointed to the chair of sociology and ethics in the Meadville (Pa.) Theological Seminary. In 1889 he published *Profit-Sharing Between Employer and Employé: A Study in the Evolution of the Wages System*, a work which won universal commendation, was translated into German, and received the award of a gold medal at the Paris Exposition of 1889. His other publications include: *Laics of Daily Conduct* (1891), a non-sectarian text-book of ethics, and *Socialism and the American Spirit* (1893).

GILMAN, SAMUEL (1791-1858). Clergyman and author. He was born at Kingston, Mass., graduated at Harvard in 1811, and in 1819 was ordained pastor of the Unitarian Church at Charleston, S. C., which he continued to serve till his death. He was an active advocate of the temperance cause, and published: *Memoirs of a New England Village Choir* (1829); *Pleasures and Pains of a Student's Life* (1852); *Contributions to Literature, Descriptive, Critical, Humorous, Biographical, Philosophical, and Poetical* (1856); as well as contributions to periodicals and translations of certain of Boileau's satires.

GILMER, gil'mer, GEORGE ROCKINGHAM (1790-1859). An American lawyer and Governor, born at Lexington, Ga. After serving in the State Legislature (1818-20), where he began the agitation that resulted in the establishment of the Supreme Court, he was twice Governor of Georgia (1829-31, 1837-39); a member of Congress (1821-23, 1827-29, 1833-35), and Presidential elector for Hugh L. White (1836), and for Harrison (1840). In 1855 he published *Georgians*, a work containing much information about the early settlers of Georgia.

GILMER, JEREMY FRANCIS (1818-83). An American soldier, born in Guilford County, N. C. He was commissioned second lieutenant of engineers upon his graduation from the United States Military Academy in 1839, and until 1861 was active in making surveys, constructing fortifications, and executing various river and harbor improvements. Upon the outbreak of the Civil War he entered the Confederate service, was appointed major of engineers, and became chief engineer on the staff of Gen. A. S. Johnston. He was wounded at the battle of Shiloh, was

later appointed chief of the engineering bureau at Richmond, and in 1863 was commissioned major-general, Confederate States Army.

GILMOR, gil'môr, HARRY (1838-83). An American soldier, born in Baltimore County, Md. He entered the Confederate Army at the outbreak of the Civil War, was commissioned captain in 1862, in 1862-63 was imprisoned for five months at Fort McHenry, and in 1863 raised a cavalry battalion, of which he was made major. Subsequently he commanded the First Confederate Regiment of Maryland, and in 1864 headed the advance of the forces of Gen. J. A. Early into Maryland. In 1874 he became police commissioner of Baltimore. He wrote *Four Years in the Saddle* (1866).

GILMORE, gil'môr, JAMES ROBERTS (1822-1903). An American writer and editor, born in Boston, Mass. He entered a counting-room in 1836, met with considerable success in business, and in 1847 established in New York City a cotton and shipping firm which did a leading business in several Southern States, and of which he acted as president until 1857, when he retired from commercial life. He early began to write for periodicals, and in 1862, in conjunction with Robert J. Walker, ex-Secretary of the United States Treasury, and Charles G. Leland ('Hans Breitmann'), founded in New York the *Continental Monthly*, a magazine devoted chiefly to the cause of emancipation, his interest in which, however, he relinquished to Walker in the following year, while he himself became an occasional editorial writer on the staff of the *New York Tribune*. In the summer of 1864 he and Col. James F. Jaquess, acting as the unofficial agents of President Lincoln, entered the Confederate lines and proceeded to Richmond, where they laid before President Jefferson Davis various peace proposals, which were immediately rejected on the ground that the South would accept no terms which did not involve the recognition of the independence of the Confederacy. Gilmore's account of this mission, which appeared in the *Atlantic Monthly*, undoubtedly did much to break the ranks of the peace party in the North, and to influence many, who had previously been wavering between Lincoln and McClellan, to cast their votes for the former in the ensuing Presidential election. Gilmore engaged in business again in 1873, but retired ten years later to devote himself wholly to literature. His writings have attained considerable popularity, though his historical works have been much criticised by special students of the subjects treated. His earlier books were published under the nom-de-plume of 'Edmund Kirke.' His writings include: *Among the Pines* (1862); *My Southern Friends* (1862); *Down in Tennessee* (1863); *Adrift in Dixie* (1863); *Among the Guerrillas* (1863); *On the Border* (1864); *Patriot Boys* (1864); *A Campaign Life of Garfield* (1880); *The Rear Guard of the Revolution* (1886); *John Sevier as a Commonwealth Builder* (1888); *Advance Guard of Western Civilization* (1888); *A Mountain White Heroine* (1889); *The Last of the Thorndikes* (1889); and *Personal Recollections of Abraham Lincoln and the Civil War* (1898).

GILMORE, JOSEPH ALBREE (1811-67). An American politician, war Governor of New Hampshire. He was born in Weston, Vt. He had very little schooling, and his early business experience

was obtained in a store in Boston. In 1832 he settled at Concord, N. H., where he became the proprietor of a large grocery store. In 1848 he became interested in railroading, first as constructing agent, and then as general superintendent of the Concord and Claremont Railroad, which position he continued to hold after the road was consolidated with the Manchester and Lawrence, and other connecting roads, until 1866. His political career began in 1858, when he was elected to the New Hampshire State Senate as a Republican. He was reelected in the following year, and chosen president. In March, 1863, he was nominated for Governor by the Republicans, but there was an independent candidate in the field, and no candidate received a majority of votes as required by the State Constitution for an election. The Legislature, however, chose Gilmore, and in 1864 he was reelected by the people. His administration of the office during the most trying period of the Civil War was marked by great energy and firmness, and it was largely through his personal exertions that New Hampshire's contribution to the Union armies was increased from 15,500 to 33,258, an excess of 1800 over the State's quota.

GILMORE, PATRICK SANSFIELD (1829-92). A celebrated American military bandmaster, born near Dublin, Ireland. His first musical experience was with the town band of Athlone, and when but eighteen years of age he left his native city to go to Canada with an English band. Almost immediately on his arrival he crossed the boundary into the United States and settled in Salem, Mass., where he became conductor of a military band. The famous Gilmore's Band (see **BAND**) was organized by him at Boston in 1859, but the Civil War interfered with its full development at that time, its conductor, Gilmore, becoming a bandmaster in the Union Army. During the war he established a brilliant musical record, and in 1864, at New Orleans, gave a magnificent musical festival. His performers were the combined bands of many regiments, which, together with such novel effects as the booming of cannon to emphasize more strongly the musical rhythm, combined to make the festival memorable. The National Peace Jubilee of 1869, and the World's Peace Jubilee of 1872, held on Boston Common, gained him an international reputation. The entire musical ensemble in 1869 consisted of an orchestra of 1000, and a chorus of 10,000 voices, which number was doubled in the festival of 1872. This huge volume was still further reinforced by a powerful organ, artillery guns, bells, and other devices. Commencing with New York, Gilmore and his band began a concert tour which was as popular as it was successful, the tour covering Canada, Great Britain, and several Continental European cities of importance. He published several compositions and arrangements for military bands, but was of far greater importance as a conductor, and for the perfection to which he brought the concert military band organization. His successor in this branch of musical organization was Sousa (q.v.). He died in Saint Louis, Mo.

GILMOUR, gil'môr, RICHARD (1824-91). A Roman Catholic bishop of Cleveland, Ohio, born in Glasgow, Scotland. He was educated at Mount Saint Mary's College, Emmitsburg, Md., and in

1852 was ordained priest. After his consecration as bishop in 1872 he became widely known for his interest in Catholic education. He wrote a *Bible History* (1869), and compiled a series of readings under the name "The Catholic National Readers."

GILOLO, jə-lō'lo, or **HALMAHERA** (native name *Bato-tisma*). The largest of the Moluccas (q.v.) or Spice Islands, situated between latitude 2° N. and 1° S., and longitude 127° 27' and 129° E., east of Celebes (Map: East Indies, G 4). Its area is estimated at over 6300 square miles. It is very irregular in its form, which bears some resemblance to Celebes. The surface is mountainous and the climate tropical. The soil is of great fertility. The island belongs to the Netherlands, and is included in the Residency of Ternate. The chief towns are Galela and Patani. The population is estimated at 120,000, and consists of Malays and Alfuros.

GILPIN, gıl'pın, **BERNARD** (1517-83). An English clergyman, known as the 'Apostle of the North.' He was born at Kentmere, Westmoreland. He studied at Queen's College, Oxford. Soon after graduation he was chosen fellow of his college, and took orders in 1542. On the opening of the new foundation of Christ Church, Wolsey made him one of the head masters. At that time the university was divided on the subject of the Reformation. Gilpin at first took ground against it, but later embraced it. In 1552 he became Vicar of Norton, and was licensed by Edward VI. as a 'general preacher.' He soon resigned his benefice, however, and went abroad and lived at Louvain and Paris. Returning to England during Queen Mary's reign, he found the persecution of the Protestants still in progress. His uncle, Bishop Tunstall, of Durham, gave him the living of Easington and the archdeaconry of Durham, later the rectory of Houghton-le-Spring; protecting him also, notwithstanding his open avowal of Protestant opinions. He devoted himself to the diligent prosecution of his parish work and to itinerant labors through the country. Queen Elizabeth offered him the Bishopric of Carlisle, which he declined. He continued until his death rector of Houghton, residing constantly in his parish except when he visited the ruder parts of the county of Northumberland. The people in certain districts had long led a lawless life, subsisting mostly on plunder. Gilpin went fearlessly among them, and did much to change the character of the country. His chief labors, however, were in his own parish of Houghton, which included fourteen villages. He was a bachelor, and in hospitality resembled the character ascribed to the primitive bishops. Every fortnight 40 bushels of corn, 20 bushels of malt, and a whole ox were consumed in his house, besides ample supplies of many other kinds. He maintained an open table for his people every Sunday from Michaelmas to Easter. The rectory house was also open to all travelers, and so great was the reverence which surrounded him that his liberality was rarely abused. He died at Houghton-le-Spring March 4, 1583. Consult his life by Carleton (London, 1629); also the life by Collingwood (London, 1884). Four of his sermons were reprinted (Houghton-le-Spring, 1835).

GILPIN, **HENRY DILWOOD** (1801-60). An American lawyer. He was born in Lancaster, England, where his father, Joshua Gilpin, a Philadelphia manufacturer and author, was liv-

ing at the time. He was educated in England up to 1816, when he removed to America, and graduated at the University of Pennsylvania in 1819. He was admitted to the bar in 1822, and rapidly established himself in an extensive practice in Philadelphia. In 1832 he was appointed by Jackson to succeed Dallas as United States District Attorney for Pennsylvania, and served until 1837. At the same time he acted as one of the Government directors of the United States Bank, and actively seconded Jackson's radical efforts to destroy that institution. This activity reacted upon him toward the end of the Administration, when the Senate refused to confirm his appointment as Governor of Michigan Territory. In 1837 he was appointed by Van Buren Solicitor of the United States Treasury, and in 1840 he was appointed Attorney-General of the United States, a position which he retained until the inauguration of President Harrison. He never reëntered public life, but spent his remaining years in travel and literary pursuits and in the practice of his profession, and for the next twenty years he was one of the best-known members of the American bar. From 1826 to 1832 he edited the *Atlantic Souvenir*, the first American literary annual. He was a frequent contributor to magazines and reviews. Besides legal reports, he edited *The Papers of James Madison* (3 vols., 1840), and *Opinions of the Attorney-Generals of the United States from the Beginning of the Government to 1841* (2 vols., 1841). He also published: *Biography of the Signers of the Declaration of Independence* (1826); a translation of Chaptal's *Essay on Import Duties and Prohibitions* (1841); and *Life of Martin Van Buren* (1841).

GILPIN, **JOHN**. The hero of a humorous poem by William Cowper (q.v.), first published in the *Public Advertiser*, in 1782. Cowper heard the story from Lady Austen, who in turn had heard it in her childhood. As to the historical reality of John Gilpin, there is a discussion in *Notes and Queries* (London, 2d series, viii., ix., x., 1856; 3d series, ii., 1862; 5th series, ix., 1874; 6th series, i., ii., v., 1880).

GILPIN, **WILLIAM** (1724-1804). An English author. He was born at Scaleby Castle, near Carlisle, and was educated at Oxford. For thirty years he conducted a school at Cheam, Surrey. His works, embracing biographies, descriptions of natural scenery, and religious publications, include: *Lives of Bernard Gilpin, Latimer, Cobham, Huss, Wycliffe, Zisca, Jerome of Prague; Lectures on the Church Catechism* (1779); *Exposition of the New Testament* (1790); and *Remarks on Forest Scenery and Other Woodland Views* (1790).

GIL POLO, hël pō'lo, **GASPAR**. See **POLO**, **GASPAR GIL**.

GILSONITE, gıl'son-it (named in honor of S. H. Gilson, owner of a large deposit of the mineral). An asphaltic mineral, closely resembling grahamite (q.v.), that is found in veins in the Uintah Mountains of Utah. It is black in color, a non-conductor of heat and electricity, and is soluble in carbon disulphide, chloroform, and the heavy distillates of Pennsylvania petroleum. The mineral is utilized in the manufacture of paints and varnishes; in 1900 the production amounted to 3279 short tons. See **ASPHALTIC COAL**.

GILTHEAD (so called from the coloring on its head). A small fish (*Sparus auratus*) of the family Sparidae, to which the scup, porgy, and sheepshead belong. It is numerous on the coast of Europe and Africa, near the shore in small shoals, feeding upon shellfish. The back is silvery gray, shaded with blue; the belly like polished steel; the sides have golden bands; and there is a halfmoon-shaped golden spot between the eyes, from which it derives the name gilthead. This fish was very generally kept in the vivaria of the ancient Romans, being much valued and easily fattened. The name is also given to a British wrasse (q.v.).

GIL VICENTE, zhél vè-sân'tá. See VICENTE.

GIL Y ZÁRATE, hél é thá'r-á-tá, ANTONIO (1786-1861). A Spanish dramatist and literary historian, born in the Escorial. He was educated in France, and upon his return to Spain was employed in the Ministry of the Interior, but was afterwards repeatedly banished from the capital because of his political opinions. He became the editor of several of the opposition journals, and afterwards obtained a State position. His tragedies include: *Carlos II. el hechizado* (1837); *Rodrigo, Don Alvaro de Luna*; and *Guzmán el bueno*. His dramatic works were published in Paris in 1850. He also wrote: *De la instrucción pública en España* (1855); a *Manual de literatura* (1846-84); and some critical studies.

GIMBALS, gim'balz (ME. *gemel*, from OF. *gemeau*, fem. *gemielle*, twin, from Lat. *gemellus*, twin). A contrivance for suspending objects on board ship so that they may remain horizontal or vertical notwithstanding the motion of the ship. As usually fitted, it consists of a ring carrying pivots on its circumference which rest in sockets in a frame or box, and of a second set of pivots on the object (as a compass, or mercurial barometer) which rest in sockets so placed on the inner surface of the ring as to permit an oscillatory motion at right angles to that of the ring.

GIMCRACK, jím'krák, Sir NICHOLAS. The principal character in Shadwell's *Virtuoso*. He affects science, and is an excellent satire on contemporary students of 'natural philosophy,' of the Shaftesbury and Bolingbroke type.

GIMLET. See BORING MACHINERY.

GIMLI, gém'lé (Icel., heaven's roof). In Norse mythology, a great hall at the world's southern end, brighter than the sun. It will stand when heaven and earth have passed away, and good and upright men will inhabit the place to all eternity.

GIMP, or **GYP** (from Fr. *guimpe*, nun's wimple, from OF. *guimpe*, wimple, OHG. *wimpal*, veil, Eng. *wimple*). A kind of trimming for dress, curtains, furniture, etc., made either of silk, wool, or cotton. Its peculiarity is that it consists of a fine wire or cord whipped around and completely covered with fine thread. See LACE.

GIN (from *geneva*, from Dutch *jenever*, from OF. *genevre*, Fr. *genièvre*, juniper, from Lat. *juniperus*, juniper), or **GENEVA**. An alcoholic drink distilled from malt or from unmalted barley or other grain, and afterwards rectified and flavored with juniper-berries. The gin which forms the common spirituous drink of the lower classes of London and its vicinity is flavored

very slightly with oil of turpentine and common salt, each rectifier having his own particular recipe for regulating the quantities to be used. The alcoholic strength of gin, as commonly sold, ranges from 22 to 48 per cent. The amount of sugar varies from 2 to 9 per cent. The larger part by far of the spirit is made in Holland, and is exported to other countries, especially to America and Northern Europe.

GIN, COTTON. See COTTON; COTTON-GIN.

GINAIN, zhé'nán', PAUL RENÉ LÉON (1825-98). A French architect, born in Paris. He studied chiefly under Lebas, and after obtaining the Grand Prix de Rome in 1852 went to Italy, where he executed several important works. He was professor at the Ecole des Beaux-Arts from 1880 until his death. Among the buildings designed and erected by him in Paris are the Church of Notre Dame des Champs, the Lying-in Hospital, the School of Medicine, and several other schools. He received 6000 francs for the excellent design submitted by him during the competitive contest for the architectural plan of the new opera house.

GINATILÁN, hé'ná-tè-lán'. A town of Cebú, Philippines, situated on the western coast, at the mouth of the Rio Ginatilan (Map: Philippine Islands, H 10). It is in a level section, where corn, rice, millet, sugar-cane, tobacco, cotton, cacao, etc., are cultivated; and the forests of the vicinity yield valuable timber. Population, in 1898, 12,144.

GINDELY, gén'de-lé, ANTON (1829-92). An Austrian historian, born and educated in Prague. He was appointed professor at the Oberrealschule in 1853, and at the university in 1862. About the same time he was made archivist for the Kingdom of Bohemia. Besides the important *Geschichte des dreissigjährigen Krieges* (1869-80) not completed, his principal publications include: *Geschichte der böhmischen Brüder* (1856-57); *Rudolf II. und seine Zeit* (1862-65); *Waldstein während seines ersten Generalats* (1886), which provoked violent opposition; and *Ueber des Johann Amos Comenius Leben und Wirksamkeit* (2d ed. 1893). Posthumously appeared *Geschichte der Gegenreformation in Böhmen*, edited by Tupetz (1894), and *Beiträge zur Geschichte des dreissigjährigen Krieges*, edited by Hirn (1900). He also contributed numerous essays to the *Abhandlungen* of the Vienna Academy, and from 1877 to 1892 edited *Böhmische Landtagsverhandlungen von 1526 an bis auf die Neuzeit*.

GINES DE PASSAMONTE, hé'nás dá pás'sá-món'tá. One of the many thankless debtors to the chivalry of Don Quixote, in Cervantes's romance of that name. He is a galley-slave whom the knight sets free and who immediately joins his fellows in attacking their rescuer.

GINEVRA, jé-név'rá. An Italian bride whose tragic fate was commemorated by Samuel Rogers in a poem entitled "Italy." On her wedding day she concealed herself in sport within an oak chest whose spring lock fastened her down. The guests sought for her in vain, and not until years had passed was it discovered how she had met her death. The chest and a portrait of the lady were shown to the poet on his visit to Modena.

GINGER (AS. *gingiber*, OF. *gengibre*, from Lat. *zingiber*, Gk. *ζιγγίβρις*, *zingiberis*, ginger,

from Ar., Pers. *zanjabil*, from Prak. *singabêra*, from Skt. *śrngavera*, ginger), *Zingiber*. A genus of plants of the order Zingiberaceæ, natives of the East Indies. The species, of which there are about twenty, are perennial herbs with annual stems, creeping rootstalks, and leaves in two opposite rows. The flowers are in compact spikes with bracts. The rootstocks of most of the species are used as a condiment and in medicine. The most valuable and generally used are those of the common ginger (*Zingiber officinale*), sometimes distinguished as the narrow-leaved ginger, now cultivated in various tropical countries. In the East Indies this plant has been cultivated from time immemorial; in the West Indies, particularly in Jamaica, from whence the finest quality is derived, and Sierra Leone, from both of which, as well as from the East Indies, its rootstocks—the ginger of commerce—are a considerable article of export. Like the banana and other plants that have long been in cultivation, ginger is grown wholly from cuttings, having apparently lost the ability to set seed. The rootstock is about the thickness of a man's finger, knotty, fibrous, and fleshy when fresh. The stems are reed-like, generally three or four feet high, invested with smooth sheaths of the linear-lanceolate smooth leaves. The flowers are not produced on the leafy stems, but on short scapes in spikes about the size of a man's thumb, and are of a whitish color, the lip streaked with purple. The cultivation of ginger is extremely easy wherever the climate is suitable. In India it is carried on to an elevation of 4000 or 5000 feet on the Himalayas, in moist situations. It may be cultivated at higher latitudes if the rootstocks are taken up and protected during the winter. In harvesting the crop the rootstock is taken up when the stems have withered, and is prepared for the market either by scalding in boiling water—in order to kill it—and subsequent drying, or by scraping and washing. The first method yields black or coated ginger; the second white or scraped ginger; the blackest of black ginger, however, being only a stone color, and the whitest of white ginger very far from perfectly white, unless bleaching by chloride of lime be afterwards employed, as is done not unfrequently to improve its appearance, a process not otherwise advantageous. Ginger found in the shops is sometimes covered with a white coating, usually of lime. This is thought to improve its appearance, but usually covers an inferior grade. There is a considerable difference, however, in the original color of the rootstalks of ginger of different countries, which is supposed to be owing to difference in the varieties cultivated. The uses of ginger, both in medicine as a stimulant and a carminative, and in domestic economy as a condiment, are too well known to require particular notice. The principal constituents of ginger-root are a pale yellow volatile oil called 'oil of ginger,' gingerol, oleoresin, and often as much as 20 per cent. of starch. The yield of oleoresin is from 5 to 8 per cent. Medicinally, ginger is used as a fluid extract, oleoresin, tincture, powder, and in various standard preparations as compound rhubarb powder, etc. Candied ginger, or preserved ginger, consists of the young rootstocks preserved in sugar, and is now exported in considerable quantity from China, as well as from the East and the West Indies. It is a

delicious sweetmeat, and is useful also as a stomachic. Essence of ginger, much used for flavoring, is in reality a tincture prepared of ginger and alcohol. Syrup of ginger is used chiefly by druggists for flavoring. Ginger tea, an infusion of ginger in boiling water, is a domestic remedy very useful in cases of flatulence. Ginger beer is a well-known beverage flavored with ginger. Ginger wine is a cheap liquor flavored with ginger. Ginger was known to the Romans, and is said by Pliny to have been brought from Arabia.

Another species of ginger is zerumbet (*Zingiber Zerumbet*), also called broad-leaved ginger, cultivated in Java, and of which the rootstock is sometimes erroneously called round zedoary. The rootstock is much thicker than that of common ginger, and is less pungent. The rootstock of the cassumunar (*Zingiber Cassumunar*), sometimes called yellow zedoary, has a camphor-like smell, and a bitter aromatic taste. It acquired a high reputation as a medicine in England and throughout Europe about the close of the seventeenth century, but having been extolled not merely as a stimulant and stomachic, but as possessing virtues which did not in reality belong to it, it soon sank into oblivion. The rootstock of the mioga (*Zingiber Mioga*) is less pungent than ginger, and is much used in Japan. Cattle sent to graze in the jungles of Northern India during the rainy season are supplied with the rootstock of a species of ginger (*Zingiber capitatum*), to preserve their health. The root of *Asarum Canadense* is sometimes called Indian ginger or wild ginger in North America, and is used as a substitute for ginger. It has a grateful aromatic odor and taste, and is stimulant, tonic, and diaphoretic. See ASARABACCA; Plate of FLAVORING PLANTS.

GINGER, WILD. See ASARABACCA.

GINGERBREAD-TREE. See DOOM-PALM.

GINGER FAMILY. See ZINGIBERACEÆ.

GING'HAM (probably from Javanese *ging-gang*, perishable, fading; less plausibly from Fr. *Guingamp*, a town in Brittany). A cotton fabric originally introduced from India. It differs from calico in that its colors are woven in and not afterwards printed. At first the Indian gingham consisted of cotton cloths, with two or more colors arranged as a small checkered pattern; now a great variety of designs is found in this material, and in the case of umbrella gingham the whole piece is woven with yarn of one color. Other cotton stuffs, such as zephyrs and chambrays, partake of the nature of gingham.

GIN'GILI. See SESAMUM.

GINGUENÉ, zhân'ge-nâ', PIERRE LOUIS (1748-1816). A French man of letters, born at Rennes. He first came into prominence through his critical articles to the *Mercur de France*, and later by his verses. In 1791 he published *Lettres sur les Confessions de J.-J. Rousseau*, in which he gives high praise to Rousseau. In the beginning of the Revolution he spread the principles of justice and of liberty in his paper, *La Feuille Villageoise*; but when his paper criticised the ensuing excesses Ginguéné was imprisoned. As Director-General of the Commission of Public Instruction, he aided greatly in the reorganization of popular education from 1794 until 1798, when he was appointed by the Directory

GINKGO AND KENTUCKY COFFEE TREE



KENTUCKY COFFEE TREE (*Gymnocladus Canadensis*).



GINKGO TREE (*Ginkgo biloba*).

Minister Plenipotentiary to Sardinia. Meanwhile he had been contributing to the *Histoire littéraire de la France* (begun by the Benedictines). The last years of his life were devoted to literature, his ablest work being his *Histoire littéraire de l'Italie*; second edition by Daunou (14 vols., 1824-35).

GINKEL, gîŋ'kel, or **GINCKELL**, GODART VAN (1630?-1703) first Earl of Athlone. A Dutch general in the English Army. The eldest son of Godard Adriaan van Reede, Baron Ginkel, he was born at Utrecht about 1630. He was trained for the army, and in 1688 accompanied William of Orange to England. The following year he distinguished himself in the capture of a mutinous Scotch regiment at Sleaford, Lincolnshire, and in 1690 went to Ireland with the King, and was conspicuous in command of a body of Dutch cavalry at the battle of the Boyne. He was left as general-in-chief when William returned to England. He captured Ballymore, reduced Athlone, defeated Saint Ruth at Aughrim with terrible slaughter, marched on Galway, which capitulated, and completed the conquest of Ireland by taking Limerick. His return to London through England resembled a triumphal progress. He received the thanks of Parliament, and was created Baron of Aughrim and Earl of Athlone. He continued in the English service, and in 1692 accompanied William to the Continent. He was present at the battle of Landen and assisted in the destruction of the French magazines and stores at Givet. At the renewal of hostilities in 1702 he commanded the Dutch troops under Marlborough, but before the campaign had proceeded far, died, after two days' illness, at Utrecht, February 11, 1703.

GINKGO, jîŋk'gô (Japanese, from Chinese *yin-king*, silver apricot, from *yin*, silver + *king*, apricot). A genus of plants represented by a single living species, which is the sole survivor of an important ancient group of gymnosperms known as the Ginkgoales. The *Ginkgo biloba*, or *Salisburya adiantifolia*, as it is sometimes called, is the well-known maidenhair-tree of cultivation, a popular name suggested by the fact that the leaves resemble those of the ordinary maidenhair fern (*Adiantum*). It has been cultivated for centuries in China and Japan as a sacred tree in connection with temple groves, and it has become common in ornamental cultivation in all civilized countries. It was supposed to be unknown in the wild state until its recent discovery in certain forests of Western China.

The tree has the general habit of a conifer, with central shaft and wide-spreading branches. It is recorded that it sometimes reaches a height of nearly 100 feet, and a trunk circumference of more than 25 feet. The characteristic leaves have long and slender petioles, with broad, wedge-shaped, and variously lobed blades, and a distinctly forking vein system. The leaves are also deciduous, a very rare habit among gymnosperms. The spore-bearing organs—that is, the stamens and ovules—are borne upon short, spur-like shoots, the stamens being in loose, catkin-like clusters, while the ovules usually occur in pairs at the summit of a long stalk. As a rule but a single one of the pair of ovules develops into the mature seed, a development which occurs whether fertilization takes place or not.

Until recently ginkgo was included among the

conifers, but further knowledge of its structure has caused it to be set apart as a group by itself, equal in rank to Cycadales, Coniferales, and Gnetales, the other three living groups of gymnosperms. Prominent among the recent discoveries in connection with ginkgo has been the discovery of ciliated (hence motile) male cells, identical in general character with those discovered in the Cycadaceæ (q.v.). The embryo is an exception among gymnosperms, since it does not develop the usual suspensor, but the fertilized egg directly produces the embryo proper. As in the cycads, the embryo develops two cotyledons, and between them there is a very conspicuous plumule (shoot-bud). Ginkgo also shares with cycads the feature that its seed becomes plum-like, a testa with fleshy outer and stony inner layers being organized. Often without pollination, and hence, of course, without fertilization, the seed attains its usual size, and the two layers of the testa are developed. The starchy kernel of the seed has an almond-like flavor, and is eaten, after slight roasting, by the Chinese.

The ginkgo was introduced into the United States toward the close of the eighteenth century, and, because of its symmetrical shape and freedom from attacks of injurious fungi and insects, it has come into favor as an ornamental and street tree. It is hardy as far north as Massachusetts, and at Washington, D. C., it grows quite well, several streets being planted with this species. Where employed as a street tree, only staminate specimens should be planted, so as to escape the annoyance of the falling disagreeable smelling fruits in autumn.

Ginkgo is a very ancient genus, since it probably grew during Carboniferous time. An ancestral type, with lobed leaves, *Ginkgophyllum*, has been found in the coal measures of Great Britain and in the Permian deposits of the Ural. The genus *Ginkgo* itself has been found in the Permian and Jurassic rocks of Northern Europe and Australia, and it enjoyed an almost universal distribution during Tertiary time. Several allied genera, *Baiera*, *Rhipidopsis*, *Dichranophyllum*, and *Trichopitys*, have been described from those formations.

GINNUNGAGAP, gîn'noong-â-gâp'. See BURI.

GINSENG, jîn'seng (Chinese *jin-tsang*, likeness of a man; less probably, first of plants). The yellowish root of *Panax ginseng*, highly esteemed as a medicine by the Chinese, who believe that it possesses extraordinary virtues for all diseases, particularly for exhaustion of body and mind. Specimens resembling the human form are sometimes sold for their weight in gold. This species, which is a native of China and adjoining territory, is from one to two feet tall, has five almost smooth leaves, with long petioles, between which arises the long-stalked umbel of inconspicuous flowers which are succeeded by numerous scarlet berries. It is cultivated in China and Korea. A description of this species and its properties led to the discovery in 1716 of the American species *Panax quinquefolium*, which so closely resembles Asiatic ginseng that an extensive export trade of wild roots soon followed its introduction in China. Its natural range is from the borders of the Mississippi eastward: in the Southern States it is almost confined to the highlands and the mountains. The Northern root is considered of superior quality

and commands the highest prices. The decreasing supply of wild ginseng has been insufficient to meet the demand, and the price has risen from 52 cents in 1858 to \$5.55 in 1902. This state of affairs has led, in various localities, to many experiments in growing ginseng, all of which failed until about 1885, when George Stanton grew the plant in beds in the forest at Apulia, N. Y. He later succeeded in growing it under an artificial shade of lath. Since the publishing of his methods interest in the plant has increased, and many beds have been set out. The small quantities of cultivated root so far marketed have commanded 20 per cent. or more in advance of the price paid for wild roots gathered in the same district. Ginseng succeeds best in well-drained, loose, friable loam, rich in humus, potash, and phosphoric acid, but not in nitrogen. In its present state of development the root requires about five years to reach marketable size, but at \$2.50 a pound it should more than pay the expenses of growing. So great is the interest in the crop that the introduction of improved varieties is highly probable. The exorbitant prices paid for seeds, young plants, and for the dried root during the years 1898-1902, it seems, cannot persist, since they are due partly to over-appreciation of the Chinese demand for the root, to speculation, and to the newness of this plant as a cultivated crop. Two fragrant aromatic species, *Panax fruticosus* and *Panax cochleatus*, natives of the Moluccas, are used in India as medicine. In European and American practice none of these species are employed to any extent. Consult Kains, *Ginseng* (New York, 1903).

GINTL, gën'tl, WILHELM FRIEDRICH (1843—). An Austrian chemist, a son of the physicist Julius Wilhelm Gintl. He was born and educated in Vienna, and was appointed professor of chemistry at the German Polytechnic Institute in Prague in 1870. In 1878 he became a member of the Bohemian Diet, and retained this position until 1889. He was the founder and first president of the Austrian Society for the Promotion of Chemical Industry. He became widely known through his *Studien über Crookes strahlende Materie und die mechanische Theorie der Electricität* (1880). He was editor of the department of chemistry in the *Technologisches Handwörterbuch* of Karmarsch and Heeren (1874-94).

GIOBERTI, jô-bär'tê, VINCENZO (1801-52). An Italian philosopher and statesman, born in Turin. Educated in the Church, he obtained his degree of doctor of theology in 1823, and was ordained to the priesthood in 1825. He was subsequently appointed professor of theology in the university of his native city, and on the accession of Charles Albert was selected as chaplain to the Court, an office which he filled till 1833. At this period of rising political agitation Gioberti was accused of promoting the liberal movement, was dismissed from Court, and suffered an imprisonment of four months. As another indignity his name was stricken from the list of doctors of theology on the ground that through his teachings he was a corrupter of youth. He then went to Paris and shortly after to Brussels, where he spent eleven years as private tutor in an academy, pursuing in his leisure hours his private studies. Gioberti looked upon the Papacy as the divinely appointed

agency for the elevation of Italy among the nations. A confederation of States subject to Papal arbitration, and having in the King of Piedmont a military protector, was the scheme devised by Gioberti for the unity and regeneration of his country. These views he elaborately developed in his work entitled *Del primato civile e morale degli Italiani* (1843). The liberal and conciliatory policy adopted by Rome on the accession of Pius IX., a warm admirer of the *Primato*, appeared as the verification of Gioberti's predictions and increased the popularity of his name. On his return to Italy in 1848 he was received with ovations from all classes of the people, and was chosen by several towns as their representative in Parliament. The King appointed him Senator; he subsequently was elected president of the Chamber of Deputies, and in December, 1848, became Prime Minister; but, owing chiefly to the failure of his attempt to bring about an agreement between the Pope and the Grand Duke of Tuscany, he held office for only two months, and was forced to resign. His successor dispatched him to Paris on some unimportant mission, and thus ended Gioberti's political career.

From that period he devoted himself exclusively to literary pursuits in Paris, where he died October 26, 1852. As a politician Gioberti aimed ever at the glory and aggrandizement of his country, but failed in far-sightedness, and with the course of events in Italy his influence as a political guide inevitably declined; but the depth and range of thought and strength of conviction evinced in his various works entitle him to the consideration and standing which, as a writer, he enjoys. Gioberti's remarkable gentleness in private intercourse bore no trace of the energetic force with which his writings propound an opinion or denounce an opponent. His chief writings, besides the *Primato*, are: *La teorica del soprannaturale* (1838); *L'introduzione allo studio della filosofia* (1840), which sums up his philosophical system, best stated in the proposition, 'The end creates the existence'; the *Lettre sur les doctrines philosophiques et politiques de M. de Lamennais* (1841); the treatises *Del bello* (1841) and *Del buono* (1843); the *Prolegomeni al Primato* (1845), an open attack upon the Jesuits, whom he had covertly assailed in the *Primato*; *Il Gesuita moderno* (1847), a second attack upon the Jesuits, who had replied to his *Prolegomeni*; *Del rinnovamento civile d'Italia* (1851), advocating unity of the Italian States, national independence, and suppression of the temporal power of the Pope, and forecasting the future greatness of Cavour. There appeared posthumously (1855-63) the *Riforma cattolica della Chiesa*, the *Filosofia della rivelazione*, a large part of his correspondence, and several other works. Consult: Berti, *Di Vincenzo Gioberti, riformatore politico e ministro* (Florence, 1881); Spaventa, *La filosofia di Gioberti* (Naples, 1863); Mauri, *Scritti biografici* (Florence, 1876); Zanichelli, "La giovinezza di Vincenzo Gioberti," in *Studi politici*, etc. (Bologna, 1893).

GIOBERTINE (jô-bër'tin) **TINCTURE**. A preparation for restoring writings or paintings which have from age become illegible. In some cases the process has recovered documents which have been partially expunged, and the parchment written over. (See PALIMPSEST.) The inventor

of it was Giovanni Antonio Gioberti, an Italian chemist (1761-1834), a native of Piedmont, secretary of the Society of Agriculture at Turin, and professor in the university in that city.

GIOCONDO, jò-kòndò. FRA GIOVANNI (c.1450-1515). An Italian architect, engineer, and antiquary, born at Verona. He was a Franciscan friar, studied archaeology in Rome, and made a remarkable collection of some two thousand ancient inscriptions which he presented to Lorenzo de' Medici. He was the designer of the fortifications of Treviso and of works to prevent the silting up of the lagoon of Venice. He was architect to Ferdinand, King of Naples (1489), and when Naples was taken by the French in 1495 he went with Charles VIII. to France, where he is said to have built the Pont Notre Dame, the Hotel Dieu, Chambre de Comptes, and other works. After his return to Italy the Pope appointed him (1513) architect of Saint Peter's; he succeeded Bramante, and was a co-laborer with Raphael and Giuliano da San Gallo. He is generally and with good reason believed to have designed the elegant Palazzo del Consiglio at Verona, though this may have been erected from his designs during his absence in France. He was proficient in philosophy, theology, and classical literature, wrote notes on Caesar's *Commentaries*, and published a critical edition of Vitruvius (1511).

GIOJA, jò'yá, FLAVIO. An Italian navigator of the fourteenth century, born at Pasitano, near Amalfi. He was long regarded as the inventor of the compass, but it is probable that he merely contributed to perfect the instrument and to make it available for navigation.

GIOJA, MELCHIORRE (1767-1829). A famous Italian publicist, born at Piacenza. He was educated for the priesthood, but later studied at Pavia, withdrew from the clergy, and in 1799 was appointed by the French Government director of the statistical bureau at Milan. He was among the first investigators to apply broadly statistics to questions of political economy and public morality. Some of his chief works are: *Sul commercio dei commestibili e care prezzo del vitto* (1804); *Nuovo prospetto delle scienze economiche*; and *Filosofia della statistica*.

GIOJA DEL COLLE, jò'yá dèl kòl'lá. A city in South Italy, 38 miles northwest of Taranto (Map: Italy, M 7). It markets grain, wine, almonds, and wool, and in May and September important cattle fairs are held there. Population of commune, in 1881, 16,573; in 1901, 21,721.

GIOJOSA JONICA, jò-yò'sá yò-nè'ká. A city in the Province of Reggio di Calabria, Italy, 10 miles northeast of Gerace (Map: Italy, L 9). The centre of the town is three miles from the railway station and from the Ionian Sea. It markets grain and olives. Population of commune, in 1881, 9800; in 1901, 10,247.

GIOLITTI, jò-lét'tà. GIOVANNI (1843-). An Italian statesman. He was born at Mondovì in the Province of Cuneo, and was educated at Turin. After serving for eight years in a department of the Ministry of Finance, in which he was appointed chief inspector in 1874, he was elected to the Chamber of Deputies. In 1889 he became Minister of the Treasury, and, in the following year, Minister of Finance, which position he was soon afterwards compelled to

resign because of his policy of extreme economy. After the fall of Rudini, whose financial policy he had stoutly opposed, Giolitti became President of the Ministry, in May, 1892, and, although constantly antagonized by the Chamber, succeeded in introducing many needed reforms in favor of the lower classes. In 1893 he was compelled to resign in consequence of his proceedings against the *Banca Romana*, and was succeeded by Crispi. During his term of office he displayed considerable administrative ability, and aimed consistently to lighten the burdens of the lower classes.

GIORDANI, jòr-dá'nè, PIETRO (1774-1848). An Italian author, born at Piacenza. He joined the Benedictine Order in his youth, but afterwards left it to become secretary of the Academy of Bologna (1808). His liberal political views caused him to be deprived of this post, and exposed him to persecutions at Piacenza, Florence, and Parma. His writings are numerous, and consist largely of critical essays, eulogies, and memorial addresses and political pamphlets. They were written in the best Italian prose of their day, and have since ranked as classic. One of Giordani's claims to fame is the fact that he was the first to recognize the genius of Leopardi. Giusti, Manzoni, Monti, Canova, and Capponi were also his friends. The most valuable of his writings is the collection of letters, *Epistolario*, published with the *Opere*, edited by Gussalli and Vassalli (Milan, 4 vols., 1854-62). Consult also Romani, *Della vita e delle opere di Pietro Giordani* (Mantua, 1868).

GIORDANO, jòr-dá'nò, LUCA, called FA-PRESTO (1632-1705). An Italian painter, born in Naples. He was the son of an inferior painter who continually urged him on at his work, saying, "Luca, work quickly." Thus the boy acquired the nickname of Fa-Presto. He painted with such facility that at the age of thirteen the Viceroy of Naples placed him under the instruction of Giuseppe Ribera. When still young he went to Rome, where he made many copies of the pictures by the great masters. There he was much employed by Pietro da Cortona to assist in his numerous contracts. He afterwards visited Venice and studied the works of Titian and Paul Veronese; later, on his return to Naples, he was fitted to undertake important work. Throughout his life he never lacked patronage. In 1679 he was invited to Florence by the Grand Duke Cosimo III. There he decorated with frescoes the cupola of the Corsini Chapel, later the Galleria Ricardi with a fresco of Olympus. In 1678 he executed an immense picture to commemorate the peace between France, Spain, and Holland, and the following year in Florence he painted in the Chapel of Saint Andrea Corsini. In 1690 he was invited to Spain by Charles II., and appointed painter to the King and made a knight. He painted some of his best frescoes in San Lorenzo del Escorial in the grand staircase representing "The Battle of Saint Quentin" and "The Taking of Montmorency." He also decorated other churches and palaces at Madrid and Toledo. After the death of Charles II. Giordano continued in the service of Philip V., and in 1702 he accompanied that monarch to Naples and was received with great enthusiasm. So great had now become his power of painting rapidly that it is said he painted for the Jesuits a picture of

"Saint Francis Xavier Baptizing the Indians," now in the Museum of Naples, in a day and a half. In like manner he completed the frescoes of the Tesoro di San Martino, Naples, representing the "Story of Judith," in forty-eight hours.

He painted an incredible number of pictures; all the chief galleries of Europe are well supplied with them. Madrid has a great number, and there are many others at Dresden, Vienna, Naples, and Munich. His earliest works are in the manner of Ribera, but by far the greater number are in a style formed under Pietro da Cortona. He possessed ready invention. His color is harmonious and his brush-work good; but his pictures were negligently executed. Among his best works, besides those mentioned above, are "Venus and Mars," in the Louvre; the "Judgment of Paris," in Berlin; "David with the Head of Goliath," and "Lot and His Daughters," at Dresden; "Massacre of the Innocents," Munich; "The Archangel Michael," Vienna, etc.

GIORGIO, jôr'jô, FRANCESCO DI (1439-1502). An Italian architect, engineer, sculptor, and painter, remarkable for his versatility, which makes him prominent among the artists of the Renaissance. He was born in Siena, where (after 1463) he did constructive work, especially in connection with fortifications. From 1478 he was in the service of the Duke of Urbino as military architect and engineer. In 1480 he was commissioned to construct the model for the dome of the cathedral at Milan, executed in 1493 by Giovanni Antonio de Gessato. The invention of mines at the Siege of Naples in 1495 is attributed to him. As a sculptor he may be judged by the figures in the Loggia dei Nobili, and the angels bearing candelabra in the cathedral at Siena. In painting he was a pupil of Vechietta, and imitated Fra Filippo Lippi, to which his graceful pictures in the Siena Gallery bear witness. He wrote a *Trattato di architettura civile e militare*, edited by Cesare Saluzzo in 1841.

GIORGIONE DA CASTELFRANCO, jôr-jô'nâ dâ kâ'stêl-frân'kô (c.1478-1511). One of the chief Venetian painters of the High Renaissance. His real name was **GIORGIO BARBARELLI**, the name Giorgione ('Big George') having been given him because of his ability. He was born at Castelfranco, near Treviso, in 1478, or perhaps earlier. Of his life little is known, except what Vasari relates: that he was of humble origin, and was brought up in Venice; that he was beautiful in person and of great social charm: a fine musician, singing perfectly to the lute; that he was an ardent lover and died in consequence of a love affair. Vasari's statements, however, are founded on hearsay of a later date. We know from other sources that Giorgione was a pupil of Giovanni Bellini (q.v.); he may, indeed, have been influenced by the lights and shades of Leonardo, as Vasari states. Before 1505 he executed commissions for Tuzio Costanzi, a Venetian condottiere, at Castelfranco. About 1505 he returned to Venice, where he decorated the façades of some half-dozen palaces, long since defaced. The most important of these decorations was that of the Fondaco dei Tedeschi (1508). He painted, moreover, a large easel-picture for the audience chamber of the Doge's palace, also lost. He died at Venice in 1511, at the zenith of his popularity.

In such a short life he could have executed but few of the 150 paintings attributed to him in the European galleries. Of unquestioned authenticity, supported by documentary evidence, are the three following paintings: (1) The altarpiece of the Cathedral of Castelfranco, a "Madonna Enthroned Between Saints Liberale and Francis," one of his earliest works; (2) "La Familia di Giorgione," a beautiful landscape containing idealistic figures of a young man, said to be Giorgione, with his wife and child; (3) "Three Eastern Sages," also called "Surveyors" or "Astrologers."

Critics are, for the most part, agreed in ascribing to his early period two small richly colored pictures in the Uffizi, Florence: "Moses and the Burning Bush," and "The Judgment of Solomon," and besides the "Madonna with Saints Anthony and Roch," catalogued as a Pordenone, in the Madrid gallery. Of a later period is the "Concert Champêtre," in the Louvre. Of the many portraits ascribed to him the "Knight of Malta," in the Uffizi, and the "Man in a White Costume," at Rovigo, are certainly genuine; the "Two Men," in the Berlin Museum, and the "Young Man," in the gallery at Budapest, are probably also genuine.

Among other works rightly ascribed to Giorgione are: "Christ Bearing the Cross," owned by Count Loschi, at Vicenza; "Apollo and Daphne," in the Archbishop's Seminary, Venice; the "Three Ages of Man," in the Pitti Palace, Florence; and, especially, the "Sleeping Venus," in the Dresden gallery, formerly considered a copy from Titian. This last picture is probably the most perfect representation of Venus in the art of the Italian Renaissance, and is the prototype of other representations of this subject by Venetian artists. Morelli was the first to ascribe it to Giorgione, but he rejects the "Concert," in the Pitti Palace, usually ascribed to him, although it is a picture of the greatest charm. Many other pictures are attributed to Giorgione in European galleries, and especially in the English, but most of these are not genuine.

Vasari long ago pointed out that Giorgione's position in Venetian art was like that of Leonardo in Florentine art. More than any other he contributed those elements which brought about the highest development of Venetian painting. Before his time, detail was the main consideration, but he strove after the general effect. He introduced that form of picture in which genre figures appear in a beautiful landscape—a characteristic of Venetian art. The subjects of his paintings, religious or otherwise, were subordinated to the idea of representing happy and beautiful life. Although not so great a technician as Titian, his drawing is good, and his color is bright and harmonious; a rich golden tone pervades his pictures. His chief pupil was Sebastiano del Piombo (q.v.), and he also exercised great influence upon Titian and Palma Vecchio.

BIBLIOGRAPHY. The chief authority on Giorgione is Morelli, who has done more than any one else to identify his work. Consult: *Italian Painters*, vol. ii. (London, 1892). Compare also Crowe and Cavalcaselle, *History of Painting in Northern Italy* (London, 1871); Conti, *Giorgione* (Milan, 1894); Gronau, *Zorzon da Castelfranco* (Venice, 1894); Lücke, in Dohme, *Kunst*



GIORGIONE
"THE CONCERT," FROM THE PAINTING IN THE PITTI PALACE, FLORENCE

und Künstler Italiens (Leipzig, 1879); Berensen, *Venetian Painters* (New York, 1894); Stearns, *Four Great Venetian Masters* (New York, 1901). Consult also the text and notes of Blashfield and Hopkins's translation of Vasari's *Lives*, vol. iii. (New York, 1896).

GIOTTINO, jôt-tè'nô (1324-57). An Italian painter, of the school of Giotto, called Giotti di Stefano, to distinguish him from his greater predecessor. He was employed to decorate the Vatican Palace at Rome in 1369, with other Giottesque masters (Gaddi and Giovanni da Milano). A "Deposition," in the Uffizi; a "Crucifixion" and "Adoration," in the Strozzi Chapel at Santa Maria Novella; and the legend of Constantine and Pope Sylvester at Santa Croce in Florence, are attributed to him. He stands very close to Giotto, and partly gained in delicacy what he lost in force and originality. Consult: Vasari, *Delle vite dei più eccellenti pittori, scultori ed architetti*, ed. by Milanese, vol. i. (Florence, 1878); Crowe and Cavalcaselle, *History of Painting in Italy*, vol. i. (London, 1864); Thode, *Franz von Assisi* (Berlin, 1855).

GIOTTO, jôt'tô, or AMBROGIO (or Ambrogio, shortened to Giotto) di BONDONE (c.1266-1337). An Italian architect, sculptor, and the creator of Italian painting. He was born near Florence in 1266, the son of a laborer. Two different legends explain his early study of painting: Vasari relates that while a shepherd boy he was seen by Cimabue (q.v.) drawing sheep on a slate; a commentator of Dante says that while apprenticed to a wool merchant he became attracted to Cimabue's studio, and then entered it as this master's pupil (c. 1280). But even the fact of his connection with Cimabue is now strongly contradicted. It has become evident that his style is entirely different from Cimabue's—which was a combination of the Byzantine and Roman schools—and that he was the pupil of the Roman School, developing its early Christian and classic side, and having close relation with his older contemporary Pietro Cavallini (q.v.).

Giotto's earliest works are at Assisi, in the Church of Saint Francis, where several stages in his early progress may be traced, from his intense and revolutionary but juvenile work in the life of Saint Francis, in the upper church, through the series of the "Life of Christ," in the lower church, completed in 1297 or 1298, to the masterly "Allegories of Saint Francis." Returned to Rome in 1298, Giotto painted the altarpiece for Saint Peter's (now in the Sacristy), and designed the "Navicella" in mosaic; the frescoes at San John Lateran and at San Giorgio in Velabro are also attributed to him, but are too much repainted for criticism.

The next stage in his career is marked by the decoration in fresco of the entire Arena Chapel at Padua in 1303, in three rows of compositions illustrating the "Life of Christ," and the "Life of the Virgin," in thirty-eight scenes, besides the "Last Judgment" on the inner façade, the scenes in the choir, and the "Allegories" of the dado. The simplicity, dignity, and dramatic power of these compositions are beyond praise. He reaches here the height of his genius. After executing some almost destroyed works in San Antonio, Giotto returned to Florence and then to Assisi, where he painted the four famous allegorical frescoes in the vault of the lower church—the "Marriage

of Saint Francis with Poverty," the "Triumph of Charity," the "Triumph of Obedience," and the "Glorification of Saint Francis." At some time before 1330 he executed the superb series of frescoes in the chapels at Santa Croce, of which only those in the Bardi and Peruzzi chapels survive in lamentable condition, but sufficiently to show that the religious fervor recently gained had not been lost.

The "Lives of John the Evangelist" and "John the Baptist" (cleaned in 1841 and 1863) in the Peruzzi Chapel are pronounced by many to be the master's greatest work, and the most fruitful inspiration of his successors even during the fifteenth century. The "Ascension of Saint John" also is remarkable, as are the "Dance of Herodias's Daughter" and the "Birth of John the Baptist." The scenes in the Bardi Chapel are from the "Life of Saint Francis," from which even Ghirlandajo and Benedetto da Majano drew inspiration. Giotto went to Naples in 1330, remaining there till 1333 and establishing a fruitful branch of his school. After his return to Florence he was engaged rather in works of architecture and sculpture than painting.

While Giotto's genius undoubtedly expressed itself in freest and most revolutionary fashion in frescoes, his panel pictures are both numerous and important. An early example is the "Virgin and Child with Angels" in the Academy at Florence. There are crucifixes at Santa Maria Novella, at the Ognissanti, and the Arena; important altarpieces at Santa Croce (Florence), in the gallery at Bologna, in the Louvre, and other galleries.

Giotto was also an architect, though probably not of the first rank, except as a designer. He was made chief architect of the Florentine Cathedral in 1334, and his masterpiece of design, the Campanile, called Giotto's Tower, was then begun, and though left unfinished at his death, was carried out according to his plan, even to the smallest details. It is unique among church towers for its wealth of colored patterns and architectural detail and especially of sculptures. It is a square tower, 84 meters high, in three stories. Its reliefs and statues were from his designs, executed partly by Andrea Pisano and other masters, and are among the best works of Italian Gothic sculpture. They are characteristic, allegorical, and philosophic themes of the creation and the moral qualities of man, and the various occupations of human life, artistic, scientific, intellectual, and material. Giotto's share in the building of the cathedral is less clear.

His style was broad and simple, his coloring light and clear, his figures animated and full of expression, in contrast to the previous Byzantine style. At his death his style had penetrated through a large part of Italy, and his followers gave him the compliment of almost slavish imitation. The Giottesque style ruled Italy throughout the fourteenth century as no one man's style ever did before or afterwards. Among his most noted pupils was Taddeo Gaddi (q.v.). For a portrait of Dante by Giotto, see DANTE.

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GIOVANNI, jō-vān'nē, DOMENICO DI. See BURCHIELLO, DOMENICO.

GIOVANNI, FRANCESCO POGGIO BRACCIOLINI. See POGGIO BRACCIOLINI, GIOVANNI FRANCESCO.

GIOVANNI DA BOLOGNA. See BOLOGNA.

GIOVANNI PISANO. See PISANO.

GIOVINAZZO, jō'vè-nāt'sō. A city on the Adriatic, in the Province of Bari delle Puglie, Italy, 12 miles northwest of the city of Bari (Map: Italy, L 6). It has bastioned walls, a theatre, and a gymnasium. It markets wine, olives, almonds, and building-stone, and manufactures brandy and fish-nets. Population of commune, in 1881, 9665; in 1901, 11,245.

GIOVIO, jō'vè-ō, PAOLO, also known by the Latin form of his name, JOVIUS (1483-1552). A noted Italian humanist and writer. He was born at Como, and studied philosophy and medicine at Padua and at Pavia, but finally turned to literature. His excellent Latin style brought him to the notice of Leo X., who in turn recommended him to the kindness of Cardinal Giulio de' Medici, afterwards Clement VII. Clement showered favors on him, and as a compensation for the loss of all his property, incurred in the sack of Rome, 1527, made him, in 1528, Bishop of Nocera in Naples. Clement's successor, Paul III., looked with disfavor on the worldly, pleasure-loving bishop, and Giovio was compelled to retire to his magnificent villa on Lake Como, where he spent his time in the company of fine pictures and clever men. He frequently visited, however, the various Italian courts, where his genius and *esprit* were greatly admired. He died at Florence, of the gout, and was buried in the Church of San Lorenzo. Giovio was an excellent type of the ecclesiastical pagan of the Italian Renaissance. As an historian he is not to be depended on, being exceedingly incorrect in his facts and shamelessly venal. The following works, however, deserve mention: *Historiarum sui Temporis Libri XLV.* (Florence, 1550-52); *Illustrium Virorum Vitæ* (Florence, 1549-57).

GIPPSLAND, gips'länd. The southeast district of Victoria (q.v.), Australia (Map: Victoria, G 4).

GIPSIES. See GYPSIES.

GIRAFFE, jī-rāf' (formerly also *jaraff*, from Fr. *giraffe*, from Sp., Port. *girafa*, from Ar. *zarāfat*, giraffe, from *zerafa*, to walk slowly), or CAMELOPARD. The tallest of quadrupeds (*Giraffa camelopardalis*), constituting a distinct family of ruminants, Giraffidæ. It is a native of Africa, formerly extensively diffused from Nubia to the Cape of Good Hope, though apparently nowhere abundant. It is now nearly extinct south of

the Zambesi River and east of the Kalahari Desert, and numerous only in the remote interior, where it frequents arid plains. It occurs generally in small herds of from five to forty, and feeds on the leaves and small branches of trees. Its general aspect is remarkable because of the height of the fore parts and great elongation of the neck, the head being sometimes eighteen feet from the ground. The number of vertebrae in the neck is seven, no greater than in other quadrupeds, and the neck has no extraordinary flexibility, but its length is produced by an elongation, elsewhere unknown, of each vertebra. The body is short, and the back slopes from the shoulder to the tail; but the greater height of the fore parts is not owing to the length of the fore legs, which are not really longer than the hind legs, but to processes of the vertebrae which form a basis for the muscular support of the neck and head, and make a hump on the shoulders. The articulation of the skull to the neck is such that the head can easily be thrown back until it is in the same line with the neck, thus giving the animal additional power of reaching its appropriate food. The skull has empty cavities, which give lightness to the head, along with sufficient extent of surface for the insertion of the ligament which supports it. The legs are long and slender; the feet have cloven hoofs, but are destitute of small lateral toes. The head is long; the upper lip entire, projecting far beyond the nostrils, and endowed with considerable muscular power. The tongue is remarkably capable of elongation, and can be thrust far out of the mouth, and employed to grasp and take up very small objects; and by it and the mobile lips, the animal obtains its food, which consists almost wholly of the leaves and twigs of mimosa-trees. The dentition of the giraffe is bovine, but the upper jaw has no canine teeth. The head is furnished with two remarkable protuberances between the ears, generally described as 'horns,' and consisting of a bone united to the skull by an obvious suture, permanent, covered with skin and hair, and terminated by long hard bristles. The nearest analogue is the horn-core of the pronghorn. The ears are moderately long; the tail is long, and terminates in a tuft of long hair that nearly reaches the ground. There is a callosity on the breast. The neck has a very short mane. The hair is short and smooth, reddish white, marked by numerous dark rusty spots.

The eye of the giraffe is very large, lustrous, and commands a wide angle of vision; and the nostrils have a muscle by which they can be closed against blowing sand. It is an inoffensive animal, and generally seeks safety in immediate flight, although it is capable of making a stout resistance, and fights by kicking with its hind legs, discharging a storm of kicks with extraordinary rapidity. It is not easily overtaken even by a fleet horse, and has greatly the advantage of a horse on uneven and broken ground. Its pace is a gallop, the hind legs reaching ahead and astride of the fore feet at every leap. Wise hunters who attempt to pursue giraffes at all on horseback try to push them so hard at first as to get them 'blown,' after which they can drive them steadily toward camp; otherwise the giraffe may gallop for miles. They are exceedingly keen of smell and

GIRAFFE AND OKAPI



1 GIRAFFE (*Giraffa camelopardalis*)

2 OKAPI

hearing, see well, and are game that tax the skill of good sportsmen; yet great numbers have recently been killed for their hides.

The giraffe was known to the ancients, and was exhibited in Roman spectacles. Representations of it appear among Egyptian antiquities. It has been supposed to be the *zemer* of the Jews, translated *chamois* in the English Bible (Deut. xiv. 5). Giraffes are among the rarest and most valuable animals in captivity, although they will thrive well with proper care. In 1892 the last giraffe in the gardens of the London Zoölogical Society died, and for the first time since 1836 the animal was not on exhibition in London; the secretary of the society reported that he saw no immediate prospect of obtaining a living specimen. They have bred in Europe.

A second quite distinct species of giraffe has lately been discovered among those remaining in South Africa, named *Giraffa australis*. The principal characteristics of the new form (consult De Winton, *Proceedings of the Zoölogical Society of London*, 1897, p. 273) are the large size of the median horn, and a generally larger size. Moreover, a brief description has been given by Sir Henry Johnson of a more brilliantly colored giraffe, existing in Uganda, which Beddard (*Mammalia*, 1902), thinks will probably prove to belong to a distinct genus, as it has five horns, the additional pair being placed above the ears. The okapi (q.v.) is also a genus of giraffes.

FOSSIL FORMS. The modern giraffe is the lone relic of the family Giraffidæ that was rather widely distributed during later Tertiary times. The origin of the family is not known, though it seems to have split from the other ungulates at a late date, and to be closely allied to the deers and oxen. Fragmentary skeletons like that of the modern giraffe, perhaps of the same species, are found in the Pliocene deposits of Europe and India. The earliest forms, found in the Pliocene beds of India, Persia, and Southern Europe, have more heavily built skeletons, with shorter necks and larger horns, than does the modern species, and the horns, of which there are often two pairs, are found on the skull of the male only. The principal fossil genera are *Samotherium* and *Sivatherium* (qq.v.).

The best accounts of giraffes are found in the writings of African sportsmen-travelers, such as the books of Sir W. C. Harris, Gordon Cumming, C. J. Andersson, Sir Samuel Baker, H. A. Bryden, and especially of H. C. Selous.

Consult, also, authorities mentioned under ANTELOPE, so far as they relate to Africa; and see PLATE of GIRAFFE AND OKAPI.

GIRALDA, hê-râl'dâ (from Sp. *girar*, to turn). A square tower of the Cathedral of Seville, Spain, built between 1184 and 1196 as a minaret of a mosque. The tower measures 50 feet at its base, and tapers slightly toward the top, 250 feet above. It is richly decorated in Moorish style. From the top of the tower rises a square belfry 100 feet in height, dating from 1568, terminating in a small dome. The latter is surmounted by a statue of Faith, which in spite of its great weight is adjusted to turn freely with the wind, and gives the tower its name. The architecture of the Giralda has been effectively applied to the tower of the Madison Square Garden in New York.

GIRALDÈS, zhê-râl'dàs', JOACHIM ALBIN CARDOZO (1808-75). A French surgeon, born at Oporto, Portugal, and educated in Paris. After acting as surgeon of the Central Bureau of Hospitals at Paris for six years (1848-54), he was compelled to abandon his surgical activity in consequence of an accident. One of the constituent parts of the human testicle bears his name. His contributions to medical science include: *Des luxations de la mâchoire* (1844); *Du traitement des aneurysmes poplités par la compression* (1845); and *Recherches sur les kystes muqueux du sinus maxillaire* (2d ed. 1860). He gave a summary of his long experience as surgeon at the Children's Hospital, Paris, in *Leçons cliniques sur les maladies chirurgicales des enfants* (1869).

GIRALDI, jê-râl'dê, GIOVANNI BATTISTA, sur-named CINTIO (1504-73). An Italian author, born at Ferrara. He studied medicine, philosophy, and belles-lettres, and became Secretary of State under the Dukes Ercole d'Este II. and Alfonso II. of Ferrara. As a member of the Accademia delle Affidati he took the name of Cintio. He is the author of a number of works, particularly *Orbecche* (1541), and several other tragedies, and *Gli hecatommiti* (1565), "A Hundred Tales," translated into French as *Les cents excellents nouvelles* in 1583 by G. Chappuys. The plots of two of Shakespeare's plays, and several of Beaumont and Fletcher's, are traced to his writings.

GIRALDUS DE BARRI (1146?-1220?). An English ecclesiastic and chronicler, best known as Giraldus Cambrensis. He was born in Pembrokeshire of a noble Norman family, and was educated by his uncle, who was Bishop of Saint David's. During his youth he thrice visited Paris, studying and lecturing at the university there. He took holy orders, probably in 1172, and was soon afterwards appointed Archdeacon of Brecknock, in which capacity he showed himself an ardent champion of ecclesiastical privilege and a strict disciplinarian. On the death of his uncle in 1176 Giraldus was chosen Bishop by the chapter of Saint David's, but failed of confirmation by the King, and retired to the University of Paris, where he resumed the study of canon law and theology. He returned to England in 1180, and in 1184 he visited Ireland as preceptor to John, the youngest son of Henry II. In 1188 appeared his *Topographia Hibernica*, a description of Ireland, which still possesses great antiquarian value, though open to criticism in many respects. A tour of Wales which he made in 1188 in the company of Baldwin, Archbishop of Canterbury, resulted in the writing of the *Itinerarium Cambriæ*, which appeared in 1191. About this time Giraldus was offered the bishoprics of Llandaff and Bangor, but refused to accept either, in expectation probably of succeeding to the See of Saint David's, on which his heart was set. In 1198 that office fell vacant and Giraldus was again elected by the chapter, but only to be rejected again by the King, the chief reason for his failure being, perhaps, his Welsh nativity. After a contest lasting five years and repeated appeals to the Pope, Giraldus accepted defeat, resigned his office of archdeacon, and devoted himself henceforth to study. Giraldus's writings, though disfigured by credulity, and marked, in the personal narratives with which they abound,

by excessive vanity, are of great value as materials for the political history and the social condition of the age and the country which they describe. They must be read, however, with caution. His works have been edited in the *Rolls Series* in 8 volumes (1861-91), vols. i-iv. by Brewer, vols. v-vii. by Dimock, vol. viii. by Warner. The *Topographia Hibernica*, *Expugnatio Hibernica*, *Itinerarium Cambriae*, and *Descriptio Cambriae* are published in one volume in Bohn's Antiquarian Library. Consult: Owen, *Gerald the Welshman* (London, 1889); and Gross, *Sources and Literature of English History* (London, 1900).

GIRANDOLA, jê-rân'dô-lâ. A splendid display of fireworks formerly given at the Castle of Sant' Angelo, Rome, on the coronation of a new Pope and at the feast of Saint Peter, June 29th. It was later transferred to the Pincian Hill, and given on the first Sunday in June.

GIRANDOLE, jê-rân'dô-lâ, BERNARDO DELLA. See BUONTALENTI, BERNARDO.

GIRARD, jî-rârd'. A city and the county-seat of Crawford County, Kan., 26 miles south by west of Fort Scott; on the Atchison, Topeka and Sante Fé and the Saint Louis and San Francisco railroads (Map: Kansas, H 4). It is the centre of a fertile agricultural and stock-raising section, near extensive bituminous coal fields, and has zinc-smelters, a foundry, and stove-works, flour-mills, brick-yards, and other industrial establishments. The water-works are owned by the municipality. Population, in 1890, 2541; in 1900, 2473.

GIRARD, CHARLES (1822-95). An American naturalist, born at Mülhausen, Alsace. He was a pupil and assistant of Louis Agassiz at Neuchâtel, and later was associated with Agassiz in scientific investigations in the United States from 1847 to 1850. In 1850-59 he was connected with the Smithsonian Institution. With Prof. S. F. Baird (q.v.), of the Institution, he made extensive studies of reptiles and wrote the article "Reptiles" in Stansbury's *Exploration and Survey of the Great Salt Lake of Utah* (1853), and a *Catalogue of North American Reptiles in the Museum of the Smithsonian Institution: Part I., Serpents* (1853). Among his independent writings are *Herpetology of the United States Exploring Expedition Under the Command of Captain Wilkes* (1858), and a "Report upon Fishes" for Emory's *Survey of the United States and Mexican Boundary* (1859).

GIRARD, zhê-râr', FIRMIN (1838-). A French genre painter, born at Poncin (Ain). He studied under Gleyre in Paris. His works are painted anecdotes, such as "The Fiancées," "The First Communion," "After the Ball," "The Betrothal," and "A Wedding in the Last Century." They are executed in brilliant colors and are minutely finished. Many of his pictures are owned in this country.

GIRARD, JEAN BAPTISTE, 'Le Père Girard' (1765-1850). A Swiss pedagogue, born at Fribourg. He became a novice in the Franciscan Order and was ordained at Würzburg, where he taught for several years. Then he returned to Fribourg (1804) as director of the primary schools, and remained there until 1823. His success in his chosen work was remarkable, but his ideas were considered too liberal, and the Jesuits

were more powerful than the Franciscans, so 'Le Père Girard' was compelled to give up his school. Until 1834 he taught philosophy at Lucerne; then he came back to Fribourg and lived in what one of his biographers calls 'a laborious retirement.' Here he wrote his *Cours éducatif de la langue maternelle* (1844-46), which was awarded a prize by the French Institute. Villemain, who gives him the highest praise, sums up his theory of teaching in these words: "The only, the really popular school is one in which all the elements of study serve in the cultivation of the mind, and where the child is led himself by the things he learns, and by the way in which he learns them." Girard was himself a grammarian of the first order, but he said, instead of 'a grammar of words,' let us have 'a grammar of ideas.' His influence has grown and still grows in Switzerland, France, and Italy, and is felt in much of the improvement recently made in the teaching of the elementary French schools. A critical judgment places him next to Pestalozzi among Swiss pedagogues.

GIRARD, JULES (1825-). A French scholar, born in Paris. He was successively professor of rhetoric at the College of Vendôme, and at the Lyceum of Lille, and ultimately became professor of Greek poetry at the Faculty of Letters of Paris (1874). He wrote: *Mémoire sur l'île d'Eubée* (1852); *Essai sur Thucydide* (1860-84); *Hypéride, sa vie et son éloquence* (1861); *Un procès de corruption chez les Athéniens* (1862); *Etudes sur l'éloquence attique* (1874-83); *Etudes sur la poésie grecque* (1884); and numerous articles in the magazines and journals.

GIRARD, MARC AMABLE (1822-92). A Canadian politician, born at Varennes, P. Q., and chiefly active in Manitoba affairs after the admission of that province into the Dominion of Canada in 1870. He was Provincial Treasurer in 1870-72, Premier in 1874, and between 1879 and 1883 held the offices of Provincial Secretary, Minister of Agriculture, and president of the Council. After the admission of Manitoba he was appointed a Dominion Senator. He was a Conservative in politics.

GIRARD, NOËL JULES (1816-). A French sculptor, born in Paris. He was a pupil of David at the Ecole des Beaux-Arts, and first exhibited at the Salon in 1849. His "Vintager Pressing the Grape" (1852) was bought by the Government, and his "Comedy" and "Drama" were accepted as the pediment for the side-façade of the Paris Opéra. Others of his works are 'La Rochefoucauld' and 'L'Astronomie,' both in the Louvre.

GIRARD, PAUL ALBERT (1830-). A French landscape and genre painter, born in Paris. He studied with his father and at the Ecole des Beaux-Arts, and subsequently worked for a time in the studios of Flandrin and Bellel. In 1861 he won the Grand Prix de Rome. His works, which consist chiefly of scenes from French and Algerian life, include the following: "Negro Dance at Algiers" (1875); "Moorish Interior" (1875); "Arab Hunters in Mountains of Blidah" (1883); "Strand at Villerville" (1883); "Oat Field in Picardy" (1884); "Charity Office of the Twentieth Arrondissement" (1885).

GIRARD, PHILIPPE HENRI DE (1775-1845). A French mechanician and inventor. He was born

at Lourmarin, Vaucluse, and manifested a strong aptitude for mechanical invention, also showing a fondness for botany, painting, and literature. At the age of eighteen he established a soap manufactory at Leghorn, where his family had removed on account of the Revolution, and where he supported himself for some time by painting. Returning to France after the fall of Robespierre, he became professor of chemistry and of natural history at Nice. About 1800 he went to Paris, and there established a soap manufactory. Girard invented and patented a successful flax-spinning machine, for which a reward of one million francs had been offered by Napoleon. In 1813 he established a flax-mill at Paris and another at Charonne, in both of which he made use of his machine; but although he was declared to have earned the reward offered, the fall of Napoleon in 1815 left the decree unfulfilled. Girard now on this account becoming involved in serious money difficulties, he engaged in manufacturing flax and steam navigation on the Danube until 1825. In that year he became attached to the Russian Government to promote the manufacture of flax, and later was appointed chief engineer of the mines of Poland. In 1844 he returned to France, and exhibited at an industrial exposition a large number of his inventions.

GIRARD, PIERRE SIMON (1765-1836). A French civil engineer, born at Caen. At the age of twenty-four he was engaged as engineer in the construction of roads and bridges, and upon his return from the Egyptian campaign in 1802 was appointed chief of that department. He built the canal from the Ourcq River to Paris (1802-20), and in 1819 was director of the Department of Gaslight Illumination in that city, in which capacity his researches on the then comparatively new illuminating agent were highly important. His principal writings include: *Traité analytique de la résistance des solides* (1798); *Rapport des ponts et chaussées sur le projet général du canal de l'Ourcq* (1803); *Mémoire sur le canal de l'Ourcq et la distribution de ses eaux* (1831).

GIRARD, STEPHEN (1750-1831). An American merchant and philanthropist. He was born at Bordeaux, France, the son of a sea captain; became a sailor in 1764, and at the age of twenty-three was captain and part owner of a ship engaged in the West Indian and American coasting trade. In 1776 he settled in Philadelphia, but continued in the coasting trade until stopped by the outbreak of the Revolutionary War. Espousing the cause of the Colonies, he remained in America, dealt in a small way in army supplies, and in 1780 again embarked in the West Indian trade, this time on a more extensive scale, and in a few years, by a succession of lucky ventures, had accumulated a considerable fortune. In 1810 he became largely interested in the first United States Bank, and in 1812, upon the lapsing of its charter, he purchased the greater part of its stock, and its building. He retained the old officers, only renaming it "The Bank of Stephen Girard," succeeded to much of the old bank's business, and made it one of the soundest and most successful financial institutions in America. During the War of 1812 he was the chief financial support of the Government, advancing it large sums to enable it to continue military operations, and in 1814 took up practically an entire loan of \$5,000,000, after

subscribers had been sought in vain. On the re-chartering of the second United States Bank in 1816, he became one of its principal stockholders and a director, and exercised a dominant control over its policy for many years. Upon his death he left almost his entire fortune of \$7,500,000 in public benefactions, chief of which was Girard College (q.v.), in the regulations for the control and management of which he incorporated his ideas as to freedom of thought and religious belief. Girard's personality was forbidding, and his personal appearance most unattractive. Penurious and almost miserly in small affairs, a close and shrewd business man, and a hard task-master, he was, nevertheless, generous and open-handed in his benefactions even during his life, and self-sacrificing and public-spirited to a degree, as his personal services to the people of Philadelphia, when that city was ravaged by a yellow-fever epidemic in 1793, showed. Consult: Ingram, *Life and Character of Stephen Girard* (Philadelphia, 1884); and a sketch in *Semicentennial of Girard College* (ib., 1898).

GIRARD COLLEGE. An institution for the education of orphans, founded in 1832 at Philadelphia, Pa., under the will of Stephen Girard (q.v.). Mr. Girard died in 1831, bequeathing the residue of his estate, valued at \$5,260,000, in trust to the Mayor, aldermen, and citizens of Philadelphia for the establishment of an institution for the education and maintenance of 'poor white male orphans.' The age of admission was fixed by Mr. Girard at between six and ten, and the age of leaving at between fourteen and eighteen, at which time students were to be bound out in the arts and trades. Applicants for admission were to be preferred, first as coming from Philadelphia, second from Pennsylvania, third from New York, and fourth from New Orleans. The courses of study were to be in the main practical; insistence being laid upon 'facts and things rather than words or signs.' The principles of 'pure morality' were to be taught, but the inculcation of religious doctrine in a denominational sense was forbidden, and—most famous clause of a famous will—ministers and ecclesiastics of every sect were prohibited from holding office in the college or from entering its premises upon any pretext whatsoever. Preliminary action looking to the due execution of Mr. Girard's will was taken by the Philadelphia City Councils in 1832, a board of trustees was elected in 1833, and in the same year the corner-stone of the main building was laid. This building erected in the form of a Greek temple, was completed in 1847, at a cost of nearly \$2,000,000. In the meantime suit had been brought by Mr. Girard's heirs to have his will set aside, and the case was not decided until 1844, when the United States Supreme Court, notwithstanding the pleading of Daniel Webster for the plaintiffs, held the will to be valid. In 1848 the college was formally organized with 100 pupils and 17 instructors and officers, the income at that time being about \$118,000 annually.

The management of the institution was then vested in a board of trustees elected by the City Councils. But the frequent political changes in the Councils and the consequent changes made in the board of directors produced results so unsatisfactory that by legislative act of 1869 the appointment of the directors was given to the

judiciary. Under the new board the funds of the college increased 100 per cent. and the income 200 per cent.; eight buildings were added to the six existing, and the number of pupils increased from 550 in 1875 to over 1500 in 1900. Coincidentally, the courses of study, at first elementary, were greatly extended to meet new academic and industrial conditions. They now comprise on the one hand preparation for the leading American colleges, and on the other thorough training in the leading industrial arts. Military drill under the supervision of an army officer, manual training, and summer encampments have also been introduced. The institution has met with marked success in placing the majority of its pupils in permanent and often valuable commercial positions. The total value of the property under the control of the institution is about \$16,000,000, and the annual income is \$1,000,000.

GIRARDET, zhé'rär'dä'. A family of Swiss artists. **ABRAHAM** (1764-1823) was born at Locle, and was a pupil of B. A. Nicolet. He engraved plates after Raphael, Del Sarto, and Giulio Romano, and was noted as a vignettist.—**CHARLES SAMUEL** (1780-1863), his brother, also born at Locle, was the first to engrave in relief on stone.—**KARL** (1810-71), his son, was born at Locle, and was the pupil of Léon Cogniet. He painted a number of successful historical pictures, some of which are in Versailles.—**EDOUARD HENRI** (1819-80), Karl's brother, was born at Neuchâtel. He was a genre painter and engraver.—**PAUL** (1821-93), another brother of Karl, was born at Neuchâtel. His first appearance at the Salon was made in 1842 with copper-plate engravings from four 'landscapes' by his brother Karl. Among the more noteworthy of his works are: "The Battle of Isly" (after Horace Vernet); "Washington Crossing the Delaware" (after Leutze); "The Combat of Rivoli" (after Philip-poteaux); and "The Armada in Sight of Plymouth" (after Seymour Lucas).

GIRARDIN, zhé'rär'dän', **EMILE DE** (1806-81). A French legislator and publicist. He was born in Switzerland, an illegitimate son of Alexander, Count Girardin. Until his twenty-first year he bore the name of Delamothe. After engaging in various journalistic enterprises, he was elected in 1834 a member of the Chamber of Deputies, in which he served for many years. As the founder and editor of the conservative and Royalist organ *La Presse*, he secured the patronage of the Court, and though compelled temporarily to resign the editorship during his term in the Legislative Chamber, he again conducted the paper from 1851 to 1856 and in 1866, when he sold it to the banking house of Millaud & Co. In 1867 he acquired for 500,000 francs the journal *La Liberté*, in which he served the interests of the Empire, and which he converted into a violent anti-Prussian paper. This was followed in 1871 by *L'Union Française*. After conducting various other papers, such as the *Journal Officiel* and *La France*, he retired in 1881, with a capital estimated at one million francs, after a long and conspicuous career as a journalist and legislator. In the former capacity he was probably, in some respects, the chief leader of his day. The history of his origin and early childhood is recounted in the first novel published by him, and entitled *Emile* (1827). His other writings include: *La fille du millionnaire*, a comedy in three

acts (1858); *Etudes politiques* (2d ed. 1849); *De l'instruction publique en France* (2d ed. 1842); *La politique universelle, decrets de l'avenir* (4th ed. 1854); *L'homme et la femme* (1872); *Le supplice d'une femme*, a comedy (1865), frequently republished and highly successful.

GIRARDIN, JEAN PIERRE LOUIS (1803-84). A French chemist, born in Paris. He became professor of chemistry at Rouen in 1828 and at Lille in 1858, and was appointed rector of the academy at Clermont-Ferrand in 1868. He devoted himself especially to the applications of chemistry to art, industry, and agriculture, and published: *Considérations générales sur les volcans* (1830); *Du sol arable* (1842); *Des fumiers et autres engrais animaux* (1875); *Traité élémentaire d'agriculture* (1874); and *Chimie générale et appliquée* (1868-69).

GIRARDIN, MADAME DE. See GAY, DELPHINE.

GIRARDIN, SAINT-MARC. See SAINT-MARC GIRARDIN, FRANÇOIS AUGUSTE.

GIRARDON, zhé'rär'dôn', FRANÇOIS (1630-1715). A leading French sculptor of the Court of Louis XIV. He was born at Troyes, March 17, 1630, the son of a bronze-founder, Nicolas Girardon. As a boy he entered the service of one Baudesson, a wood-carver and furniture-maker, whose son was a painter of some importance. Although intending to become a sculptor, Girardon learned to paint, and at the age of fifteen decorated a chapel of Sainte Julie in Troyes. There is some good work of the Renaissance in Troyes, which was a source of inspiration to the sculptor. His first work in sculpture was a statue of the Virgin in his native city. At this time the Chancellor Séguier undertook certain improvements at his Château of Saint-Liébaud. Baudesson, who was employed on the work, took with him the young Girardon. Séguier became interested in the boy, and, as he had been with Le Brun, sent him to Paris and afterwards to Rome. In Rome, through the influence of the painter Pierre Mignard, also of Troyes, he came under the direct influence of Lorenzo Bernini, the greatest sculptor of that day. When Girardon removed to Paris in 1653 he came into relations with Le Brun, and worked under his powerful direction for many years. He entered the Academy of Painting and Sculpture, January 7, 1657, and in the same year married Catherine du Chemin, a painter of considerable skill, who was herself admitted to the Academy in 1663. In 1668 Girardon visited Rome a second time, returning to Paris in 1669. The rôle which he now played was a large one. He was lodged in the Louvre, was professor at the Academy (since 1659) and enjoyed the full favor of the Court. In 1695 he became chancellor of the Academy. The most notable works of Girardon were the monument of Richelieu in the Church of the Sorbonne, Paris, which Alexandre Néroir saved at the risk of his life in the Revolution, and the equestrian statue of Louis XIV., which once stood in the Place Vendôme. The group of the "Rape of Proserpine" at Versailles may also be mentioned. There are many busts, bas-reliefs, and small works in the Louvre (Paris). Of his decorative work, done under the influence of Le Brun, there is a little in the Gallery of Apollo in the Louvre. The greater part of it, however, is grouped about the

palace and park of Versailles. It is all interesting, and some of it, like the nymphs in the bas-reliefs of the "Baths of Diana," lovely and delicate.

Consult: Corrad de Breban, *Notice sur la vie et les œuvres de Girardon* (Paris, 1850); Genevay, *Le style Louis XIV.* (ib., 1886); Gonse, *La sculpture française* (ib., 1895); Lambert, *Versailles et les deux Trianons* (ib., 1900).

GIRART DE ROSSILHO, zhé'rär' de rôs-sé'lyô. An epic poem composed in a northern Provençal dialect, and forming part of the Carolingian cycle. Consult Saintsbury, *French Literature* (Oxford, 1882).

GIRASOL, jîr'a-sôl (Fr., Sp., Port. *girasol*, from It. *girasole*, from *girare*, to turn, from Lat. *gyrus*, circle). A name given to precious stones that show reflections of bright red or yellow light, which apparently come from the interior of the mineral. The name is especially applied to the *fire opal*, which is of a milky bluish color, translucent, and shows reddish reflections in a bright light. The best-known specimens are found at Zimapan, Mexico, and in the Faroe Islands. (See **OPAL**.) The name has also been given to the *asteriated sapphire*, or star sapphire, fine specimens of which have been found in India. *Girasols* were highly esteemed by the ancients, and when of good quality commanded high prices. They are now made artificially, and are no longer so highly prized as formerly.

GIRAUD, zhé'rô', EUGÈNE (1806-81). A French genre painter and engraver, born in Paris. He was a pupil of Richomme in engraving and of Hersent in painting; won the Grand Prix de Rome in 1826, returned to Paris in 1832, and, with the Duke of Montpensier and Alexandre Dumas, visited Spain and North Africa in 1846. Among his best-known pictures are: "Rescue of the Dauphin Charles by Stephen Marcel in 1358" (1836); "The Army of Condé and Coligny Crossing the Loire" (1837); "Dance in a Posada at Granada" (1853); "Dancing Girl in Cairo" (1866), and "The Dying Matador" (1869), both in the Luxembourg; "Jeweler in the Harem" (1874); "Flower Market Under the Directory" (1876); "Return from the Tavern" (1877). His brother and pupil, CHARLES (1819-92), painted genre scenes and interiors, such as "Spinning Women in Brittany" (1873), and "Flemish Interior" (1876).

GIRAUD, GIOVANNI, Count (1776-1834). An Italian dramatist, born in Rome. His first success was in *L'onesta non si vince* (1798). This was followed by a number of plays, among them: *L'ajo nell'imbarazzo* (1824); *Il prognosticante fanatico*; *La capricciosa confusa*; *La conversazione al bujo*; and *Don Desiderio*. His plays, collected under the title *Teatro*, were published in 1823. He was made director-general of all the theatres in Italy by Napoleon in 1809.

GIRBADEN, gër'bä-den, CASTLE OF. An extensive ruined fortress near Grendelbruch, in Lower Alsace, the inner fortress of which belongs to the tenth century, and the outer castle to the early thirteenth. Originally possessing fourteen gates and fourteen courts, it still retains evidences of the elaborateness of its design in its great square donjon, and in its hall with beautiful windows bordered with columns arranged in clusters.

GIRDER. A beam which is intended to be supported at either end, and to carry a vertical load between the ends. Girders are simple when they are supported only at the two ends; continuous when they extend over one or more intermediate supports as well; solid when, like a rolled I-beam, the upper and lower flanges are connected by a solid web; and braced when the upper and lower flanges are connected by an open framework of diagonal or combined diagonal and vertical members. (For description of plate girders and braced girders, see **BRIDGE**.) A box girder is a solid girder in which the flanges are connected by two web plates in such a manner that a cross-section of the girder is box-shaped or rectangular in form. (See **ROLLING-MILL** for a description of steel shapes.) Girders may be of timber, but they are more commonly of steel, which has almost entirely replaced cast iron and wrought iron.

GIRDLE (AS. *gyrdel*, OHG. *gurtel*, Ger. *Gürtel*, from AS. *gyrdan*, OHG. *gürten*, Ger. *gürten*, to gird; connected with AS. *gearde*, Goth. *gards*, OHG. *gart*, Ger. *Garten*, garden, and ultimately with Lat. *hortus*, Gk. *χῆρος*, *chortos*, garden, OIr. *gort*, corn-field). A band or cord worn round the body to confine or support other garments. It was minutely prescribed to the children of Israel to be worn by the priests, made "of gold, of blue, and purple, and scarlet, and fine twined linen" (Ex. xxviii. 8, xxix. 40); but it was worn by others as well: all through the Bible 'to gird up the loins' is a common symbol of activity and alertness. The *zona* (Gk. *ζώνη*), of classical antiquity was a broad band worn by young women before marriage; hence the expression *zonam virginem solvere* is a periphrasis for marriage. Men also, among the Greeks and Romans, wore a broad band or belt which often served for carrying money and other small articles. The *cingulum* or common girdle, sometimes called *cestus*, Gk. *στροβίλιον*, was worn higher, under the breasts, as in the modern Empire costume. The name *cingulum* was also applied to the sword-belt, which formed a regular part of the Roman soldier's uniform. All through the Middle Ages girdles of various shapes were part of the costume, both of men and women, used at first to confine the loose and flowing garments of the period, and frequently decorated with such great richness that numerous sumptuary laws were passed in England and elsewhere to restrain it; but by the sixteenth century the need of confinement had passed away from the more closely fitting garments of the time, and the importance of the girdle declined. For its use as a Church vestment, see **COSTUME**, ECCLESIASTICAL.

GIRDLE OF VENUS. A remarkable ctenophoran jellyfish (translation of Latin *cestum veneris*), inhabiting the Mediterranean, of a ribbon-like shape, some five or six feet in apparent length by about two inches in breadth; although, considered with reference to the structure of the animal, the apparent length is really its breadth, and the apparent breadth its length. The mouth is situated in the middle of the inferior edge, and the stomach is imbedded in the gelatinous substance. The edges are bordered by rows of swimming plates, by the movements of which the creature seems to be propelled in the water. It exhibits lovely iridescent colors by day, and bril-

liant phosphorescence by night. Its substance is so delicate that it is difficult to obtain a perfect specimen.

GIRDLER. A small cerambycid beetle (*Onchideres cingulatus*), which girdles the twigs of hickory, pear, and other trees. It is grayish brown, with a light-colored band across the elytra. In August this beetle lays its eggs near the tips of twigs, then gnaws a deep furrow around the twig behind them. The winds of autumn break off the end of the girdled twig, which falls to the ground. Then the eggs hatch, the grubs feed upon the decaying wood, leaving only a shell of bark, and attain their full growth during the summer. They then pupate, and produce imagoes a year from the time the eggs were laid. Extensive damage sometimes results from the great numbers of these twig-girdlers.

GIRGEH, gër'ge (from Coptic *Girgis*, George, in honor of the patron saint of the town). The capital of the Egyptian province of the same name, and former capital of Upper Egypt, situated on the left bank of the Nile, and about 90 miles southeast of Assiut by rail (Map: Egypt, E 6). It has a number of mosques, and a Government cotton-factory. In the vicinity is an old Roman Catholic monastery. Population, over 17,000.

GIRGENTI, jër-jân'tè (ancient Agrigentum, q.v.). The capital of the Province of Girgenti, Sicily, 84 miles by rail southeast of Palermo, 1083 feet above the sea (Map: Italy, H 10). It is three miles from the Mediterranean and six miles by rail from Porto Empedocle (q.v.). The weather is usually clear and mild. The town is the seat of a bishop, of an American consular agent, and is a station for a regiment of infantry. The fourteenth-century cathedral, with unfinished campanile, has been completely modernized. It contains a Madonna by Guido Reni, and a famous ancient marble sarcophagus with relief, illustrating the story of Hippolytus (q.v.). In the cathedral archives are many documents of the Norman period. The city museum has a fine marble statue of Apollo, vases, coins, etc. Girgenti commands a beautiful view of the sea, and at sunset in clear weather Pantelleria, 90 miles to the southwest, can be seen. It has a chamber of commerce, an important public library, founded in 1765 by Bishop Lucchesi, a technical school, a royal-technical institute, a royal gymnasium, a royal female normal school, a seminary, and a municipal theatre. The most important commercial product is sulphur, of which about 3,000,000 quintals (metric) are exported annually. There are also important salt-mines. Other products are wine, oil, almonds, grain, cheese, honey, earthenware, salt fish. Population of the commune, in 1881, 21,274; in 1901, 25,024. Consult Picone, *Memorie storiche agrigentine* (Girgenti, 1865).

GIRLS' CLUBS. See WORKING-WOMEN'S CLUBS.

GIRNAR, gîr-nâr'. A sacred mountain of remarkable aspect, in the peninsula of Kathiawar, part of the native State of Gujarat, Bombay, India, in latitude 21° 30' N. and longitude 70° 42' E., 230 miles northwest of Bombay. Above luxuriant hills and valleys surrounding its base rises a bare and black rock of granite to the height of about 3500 feet above the sea. The summit is broken into various peaks, its northern and southern sides being nearly perpendicular. An

immense boulder, which seems to be poised on one of the scarped pinnacles, is called the Beiru Jhap, or Leap of Death, from its being used by devotees for the purpose of self-destruction. On a ledge about 600 feet below the summit there is a group of sixteen ancient Jain temples.

GIRNDT, gërnt, Otto (1835—). A German dramatist. He was born at Landsberg-an-der-Warthe, and was educated at Berlin and Heidelberg. He wrote many plays, two of which were awarded prizes at Vienna and Munich. They include the comedies *Y I* (1865); *Und; Am andern Tage*; *Orientalische Wirren* (1877); *Die Sternschnuppe* (1886), a farce, with Moser; *Nervös*, a farce, with Moser (1889); *Endlich* (1891); and *Dreizehn* (1892). His tragedy *Danckelmann* (1883) was also very favorably received. His novels are less popular.

GIRODET-TRIOSON, zhë'rô'dâ' trë-ô'zôn', ANNE LOUIS (1767-1824). A French historical painter. His real name was Girodet de Roussy, and he was born at Montargis. He was adopted and educated by M. Trioison, the Court physician, whose name he assumed in later years. He was a pupil of David, and in 1789 he took the Prix de Rome. In pursuing his studies at Rome he cultivated a sentiment in his work which had not developed in the studio of David, where correct and classical drawing was considered paramount. His "Sleep of Endymion," now in the Louvre, was painted at this time; it is said the figure was copied from a bas-relief. In 1792 Girodet painted "Hippocrates Refusing Presents Sent from the King of Persia," a gift to Dr. Trioison, who bequeathed it to the Medical School of Paris. In 1802, at the request of Napoleon, he executed "Ossian and His Warriors Receiving the Shades of French Warriors," and in 1806 he exhibited his "Scene of the Deluge," which received a prize over David's famous "Sabines," but it has been severely criticised as poor in composition. "Pygmalion and Galatea," his last and one of the best works, was exhibited in 1819. His large historical pictures, the "Surrender of Vienna to Napoleon" (1808), and the "Insurrection at Cairo" (1810), both at Versailles, are less pleasing, and his portraits are cold and dry. In the "Burial of Attila" Girodet was more successful. His efforts to combine the teachings of the classic with his own romantic spirit sometimes produced grotesque results, but Girodet helped to make possible the later school of the Romanticists. He was very wealthy; he was made member of the Institute in 1815, and chevalier of the Legion of Honor in 1816. He died in Paris, and, by order of Louis XVIII., was decorated with the cross of officer of the Legion of Honor when in his coffin. Consult his *Œuvres posthumes* (Paris, 1830).

GIROFLÉ GIROFLA, zhë'rô'flâ' zhë'rô'flâ'. An opera-bouffe in three acts by Lecocq, with words by Leterrier and Vanloo, based on the adventures of twin sisters, daughters of a Spanish nobleman. It was first produced at Brussels in 1874.

GIRÓN, Hé-rôn', Don PEDRO TELLEZ Y. See OSUNA.

GIRÓN, FRANCISCO HERNANDEZ (1510-54). A Spanish soldier, born at Cáceres, Estremadura. He went to Mexico at the age of twenty-five, whence he proceeded to South America, where he engaged in the wars in New Granada, and as-

sisted in the conquest of the country. After the defeat of Pizarro (1548) he organized a revolt against Gasca at Cuzco, and defeated the royal forces under Alvarado. He was subsequently captured, condemned to death at Lima, and executed there.

GIRONDE, zhé'rônd'. A maritime department in the southwest of France, formed of part of ancient Guienne, bounded on the west by the Bay of Biscay, on the north by Charente-Inférieure, on the east by Dordogne and Lot-et-Garonne, and on the south by Landes (Map: France, F 7). Area, 3761 square miles. The surface is generally level, but hilly in the east. It is watered by the Garonne, which expands into the estuary called the Gironde, and by its affluent the Dordogne. Gironde is one of the principal wine-producing departments of France. The other products are grain, vegetables, fruit, and hemp. Population, in 1891, 793,528; in 1901, 821,131. Capital, Bordeaux.

GIRONDISTS (Fr. *Girondins*, from *Gironde*, a department of France). The party of moderate Republicans during the French Revolution. When the Legislative Assembly met in October, 1791, the most remarkable group of men in it were the Deputies, most of them new men, from the Department of the Gironde. Barennes, Ducos, Servière, Vergniaud, Guadet, Gensonné, Sers, and Grangeneuve were the chiefs of their group. They soon showed themselves to be orators of ability, and their moderate republicanism drew to their side such men as Brissot, Roland, Condorcet, Pétion (later Mayor of Paris), Dumouriez, and Lacoste. They assumed the name Girondins, controlled the *Patriote Français*, and their influence dominated the Jacobin Club. For more than a year they directed the affairs of government. They had a majority in the Assembly, and the King was forced to select Roland, Dumouriez, Clavière, and Servan as ministers in March, 1792. The forced resignation of the Girondist Ministry, some three months later, led to the popular insurrection of June 20th. Though there were elements of dissension between the Girondists and the Jacobins as early as the spring of 1792, both parties united in bringing about the overthrow of the monarchy through the insurrection of August 10, 1792. The responsibility for the September massacres is harder to determine, but probably the leaders of the Girondists were not implicated in the atrocities of the mob. After that date they lost more and more of their popularity, for though their eloquence still dominated in the Assembly, they were unable to control the Parisian rabble. The result was that the Jacobins obtained the upper hand, and ousted the Girondists from office under the National Convention. Danton and his followers triumphed over Roland and his; Dumouriez deserted the side of the Revolution, and not a single Girondist figured on the newly formed Committee of Public Safety. The failure of the Girondists to arrest and impeach Marat was followed by the invasion of the hall of the Convention by a Jacobin mob on May 31, 1793, and the arrest on June 2d. of about twenty of the leaders of the party. Many others fled to the provinces or escaped from France. Unsuccessful risings took place throughout France in their behalf, the only result being that further arrests were made. On October 3, 1793, the prisoners

were accused before the Convention of conspiracy against the Republic, and were sent to be tried by the Revolutionary Tribunal. On October 24th, therefore, they were arraigned before this body. They were at first allowed to defend themselves; but their speeches were so eloquent and their innocence so apparent that the court could not condemn them, and the Convention was forced to order that the investigation be closed, and that the prisoners be executed, October 31, 1793. This bloodthirsty decree was carried out the same evening. Brissot, the leader of the party (from whom they were sometimes known as Brissotins), Vergniaud, Gensonné, Ducos, and sixteen others were sent to the Place de Grève. On the way thither they chanted the Marseillaise, and met their death with splendid courage. Others of the Girondists were subsequently brought to the guillotine, including Madame Roland, whose charms, intellect, and ardor had made her an inspiring influence in the party. In the provinces also there were executions. Roland, Vilazé, Rebecqui, Pétion, Buzot, and Condorcet preferred suicide to the guillotine, and by the close of 1794 the Girondist Party had all but disappeared. Those of the party who survived, including Lanjuinais, Defermon, Pontécoulant, Louvet, Isnard, and La Rivière, reappeared in the Convention after the fall of Robespierre and the Terrorists, but they no longer formed a party of importance. Lamartine has written a panegyric on the Girondist Party, *Histoire des Girondins* (Paris, 1847), translated by Ryde, and published in London in the same year. For more impartial and accurate accounts, consult: Guadet, *Les Girondins* (new ed., Paris, 1889); Bire, *La légende des Girondins* (Paris, 1881); Vatel, *Charlotte de Corday et les Girondins* (Paris, 1864-72). In English, the following are worth consulting: Mignet, *The French Revolution* (London, 1826); Morse-Stephens, *History of the French Revolution* (New York, 1886-91). See FRENCH REVOLUTION, also the special articles on the various Girondist leaders, with the authorities referred to there.

GIRON LE COURTOIS, zhé'rôn' le kōōr'twā' (Fr., Giron the courteous). The hero of a thirteenth-century romance of the same name, by Rusticien, derived from an earlier romance, *Palamedes*, by Elie de Borron. The printed edition rests upon Rusticien's version.

GIROUARD, zhé'rōō'ār', Désiré (1836—). A Canadian judge of the Supreme Court. He was born at Saint Timothée, Province of Quebec, and was educated at McGill University. A work published by him under the title *Essai sur les lettres de change et billets promissoires* made him widely known, and insured his rapid advancement in the profession. He was elected the representative of Jacques Cartier in the Canadian Parliament (1878), and continued to represent that county until 1896, also acting for many years as chairman of the Standing Committee on Privileges and Elections. He strongly opposed the execution of Louis Riel, and introduced and carried several bills, the most important of which was the so-called 'Deceased Wife's Sister Bill' (1882). His literary productions include two volumes of interesting essays upon legal subjects, and the *Early History of Montreal*, translated from the French by his son.

GIROUETTES, zhé'róo'et', LES (Fr., the weather-vanes). A term of reproach applied in the *Dictionnaire des Girouettes* (Paris, 1815) to those who changed their political party on the return of the Bourbons after Napoleon's fall. The number of changes in political faith was indicated by a corresponding number of weather-cocks printed after the names.

GIRTIN, gēr'tin, THOMAS (1775-1802). An English water-color painter, born in Southwark, in 1775. He was a pupil of Edward Dayes, and a friend of Turner. Girtin was one of the founders of the English water-color school. He was a contributor to the exhibitions of the Royal Academy from 1794 to 1801, his subjects including views of London, of Paris, and scenes in Scotland and Wales, where he made extensive sketching tours; he also painted several English cathedrals. He advanced the art of water-color painting in technique, color, and poetic interpretation. He died in London. The British Museum possesses a fine collection of his drawings. Other works are found in the South Kensington Museum, the National Gallery of Scotland, and the National Gallery of Ireland. Consult Miller, *Turner and Girtin's Picturesque Views* (London, 1854).

GIRTON (gēr'ton) COLLEGE. One of the most noted institutions for the higher education of women in England. It was established in 1869, in a rented house at Hitchin, Hertfordshire, with six students. It was conducted in the main under the influence of members of Cambridge University, from among whom its lecturers were recruited. The inconvenience of its distance from that university led to its removal, in 1873, to its present location, about two miles from Cambridge. Since then it has increased greatly in numbers and influence. Its students follow essentially the same course of work as the Cambridge undergraduate who studies for honors. Since 1881 its members have been admitted to the university examinations, and their names appear in the tripos, or honor lists, in the university calendar. They do not, however, receive degrees from the university, but are granted degree certificates upon satisfying the university requirements. There are now over 100 students. The buildings are very handsome, forming three sides of a quadrangle, and are in attractive grounds. The administration is vested in an executive committee, a mistress, and a vice-mistress, and the instruction is carried on, as in a college of the university, by lecturers and tutors. See CAMBRIDGE, UNIVERSITY OF; COLLEGIATE EDUCATION FOR WOMEN.

GIRTY, gēr'ti, SIMON (1741-1818). A notorious renegade leader of the Indians. He was born in what is now Dauphin County, Pa.; was captured by the Indians, along with the rest of his family, at Fort Granville, in 1756; was released in 1759, and acted as an interpreter for some time after the conspiracy of Pontiac. In Lord Dunmore's War he served against the Indians, and for a short time thereafter was a second lieutenant in the Virginia militia. In 1776 he was appointed an Indian interpreter for the United States, but was soon discharged, after which he enlisted troops in the vicinity of Fort Pitt for service against the English. He went over to the English in April, 1776, was attainted of high treason by the Pennsylvania Legislature in July,

and became an interpreter in the employ of the British Indian Department. His name soon became a terror throughout the Western settlements, and innumerable atrocities were attributed to him, though it seems that his influence and position among the Indians were greatly exaggerated, and that he was perhaps never in command of any considerable force. After the Revolution he acted as an interpreter for the English, and was extremely active in instigating the Indians to attack the American frontiersmen. He commanded the Indians who attacked Dunlap's Station, on the Great Miami, in February, 1791; led the Wyandots at the defeat of Saint Clair; commanded the Indians who attacked Fort Jefferson, on the Mississippi, in June, 1791; and in 1794 participated in the battle of Fallen Timbers. During the latter part of his life he lived near Detroit, across the Canadian border. His brothers, George, James, and Thomas, also fought with the Indians against the United States. Consult Butterfield, *History of the Girtys* (Cincinnati, 1890).

GIRVAN, gēr'ván. A seaport town on the west coast of Scotland, 21 miles southwest of Ayr (Map: Scotland, D 4). Weaving, its former leading industry, though still carried on, has been superseded by the winter herring fishery; there is an export trade in coal and limestone from adjacent districts. It has a tidal harbor, and is frequented as a sea-bathing resort. Population, in 1891, 4001; in 1901, 4019.

GISANDER, gē'zan-dēr. The pseudonym of the German author JOHANN GOTTFRIED SCHNABEL (q.v.).

GISBORNE, giz'börn, FREDERICK NEWTON (1824-92). A Canadian inventor and electrician, born in Broughton, Lancashire, England. In 1842 he left England for a trip around the world, and finally settled in Canada in 1845, where he spent two years in farming. In 1847 he entered the employ of the Montreal Telegraph Company as an operator, and in the same year was placed in charge of their new office at Quebec. By close study he soon became an expert electrician, and original improvements in methods and instruments soon attracted so much attention to his work that, in 1849, he received the appointment of superintendent of the lines of the Nova Scotia Government at Halifax. Here he began to study the problems of ocean telegraphy. In 1852 he laid the first deep-sea cable in American waters, between Prince Edward Island and New Brunswick. In 1853 he went to New York City, where he became associated with Cyrus W. Field, and on the organization of the New York, Newfoundland, and London Telegraph Company, was appointed chief engineer of the new company. In that capacity, in 1856, he laid the land-lines across Newfoundland. He was the commissioner for Newfoundland at the London Exposition in 1862, and at Paris in 1865. In 1879 he was appointed superintendent of the Canadian Government telegraph service, which position he held until his death. Among his numerous inventions were an anti-induction ocean cable, electric and pneumatic ship-signals, an anti-corrosive composition for the bottoms of iron ships, and an electric recording target.

GIS'CO (Gk. Γίσκος). The name of three Carthaginian generals. (1) A son of the Hamil-

car who was defeated by Gelon at the battle of Himera (B.C. 480). In consequence of the defeat, Gisco was banished to Selinus, in Sicily, where he died. (2) The son of Hanno. He unsuccessfully opposed Timoleon, after the latter had defeated the Carthaginians at the river Crimissus (B.C. 339). (3) A commander of the Carthaginian garrison at Lilybæum, at the end of the First Punic War. In the year B.C. 241 he was seized and murdered by the mercenary troops who had begun the civil war called the 'Inexpiable,' and with whom the Carthaginian Government had deputed him to treat.

GISELA, gě'ze-là (?-1043). A queen of Germany and Roman empress. As the wife of Conrad II., she was crowned with him at Rome. She exerted a considerable political influence, and was largely instrumental in securing the annexation of Burgundy to the German possessions. Her influence in the Church also was paramount. She was celebrated for her beauty, her generosity, and her profound interest in the affairs of State and of science.

GISLASON, gis'la-sôn, KONRAD (1808-91). An Icelandic philologist, born at Langamyri, and educated at Copenhagen. He was professor of ancient Norse languages at Copenhagen from 1853 to 1886, and became known as a philologist through his excellent editions of the *Gíslasaga* (1849) and the *Njála* (2 vols., 1875-79), and more especially through his Danish-Icelandic Dictionary, which is recognized as an authority on those languages. Gislason bequeathed his entire fortune to the University of Copenhagen.

GISORS, zhě'zôr'. A town in the Department of Eure, France, on the river Epte, 33 miles northeast of Evreux (Map: France, H 2). It contains a richly decorated mediæval church, and in its vicinity on a hill are situated the remains of an old castle constructed by Henry II. of England. The town is famous as the scene of a battle in 1198, when the English under Richard I. defeated the French. In this battle the expression 'Dieu et mon Droit,' which has since become the motto of the royal arms of England, was used for the first time by Richard I. Population, in 1901, 4861.

GISSING, gis'sing, GEORGE (1857-1903). An English novelist, born at Wakefield, Lancaster. He first taught, but afterwards took up literature as a profession, and lived in London. His novels are significant social studies, though somewhat lacking in humor and poetry. They are written from the view-point of a pessimist, with no attempt to suggest a remedy for the evils described. He followed, in a fashion, the large descriptive scheme of Zola and Tolstoy. His works show minutely many phases of contemporary London life. They are essentially novels of disillusionment. His publications include: *The Unclassed* (1884); *Thyrza* (1888); *Life's Morning* (1888); *The Emancipated* (1890); *The Odd Woman* (1893); *Eve's Ransom* (1895)—all treating phases of the sex problem; *New Grant Street* (1891); *Denzil Quarrier* (1892); *The Whirlpool* (1897), a treatment of money in its relation to marriage, one of his most powerful works; *Charles Dickens* (1898); *By the Ionian Sea* (1901), a keen personal record of travel; *Our Friend the Charlatan* (1901), a *tour de force*; and *Demos* (1887) and *The Nether World*, which treat respectively the influence of class

distinction and the industrial problem, probably his best known works.

GITANOS, hê-tâ'nôs. See GYPSIES.

GITSCHIN, gich'in, or **JICIN**, y'chên. A town of Bohemia, Austria, situated on the Cidlina, about 50 miles northeast of Prague (Map: Austria, D 1). Among the noteworthy buildings are the handsome palace built in 1630 by Wallenstein, the former Jesuits' College, now used as barracks, and the fine church dating from 1655. The chief industries are manufactures of sugar and paper, and there is a considerable trade in grain. In the neighboring Carthusian monastery of Walditz Wallenstein was interred, but in 1785 the body was removed to Münchengrätz. Near here, on June 29, 1866, the Prussians under General von Tümping defeated the Austrians and Saxons under Count Clam-Gallas, thus opening the way to a junction of the two Prussian armies, and the subsequent victory of Sadowa. Population, in 1890, 8457; in 1900, 9790, mostly Czechs.

GIUDICI, jō'dê-chê, PAOLO EMILIANI (1812-72). An Italian historian and man of letters. He was born in Sicily, June 13, 1812. During a few months of 1848 he was a professor of Italian literature in the University of Pisa, but was removed because of his liberal tendencies. He was later made professor of æsthetics and secretary of the Academy of Fine Arts at Florence. This second professorship he relinquished in 1862, and in 1867 he was elected a Deputy to the Italian Parliament. He died at Tunbridge, England, September 8, 1872. Giudici's chief works are: *Storia delle belle lettere in Italia* (1844), republished as *Storia della letteratura italiana* (4th ed. 1865); *Storia del teatro in Italia* (1869); *Storia dei comuni italiani* (1866); an Italian translation of Macaulay's *History of England* (1856); and an essay, *Intorno ai poeti lirici d'Italia*, prefaced to the *Floreggio dei lirici più insigni d'Italia* (1846-47). Consult *Biografia di Paolo Emiliani Giudici* (Florence, 1874).

GIUGLIANO, jō-lyâ'nô, IN CAMPANIA. A city in the Province of Naples, Italy, eight miles northwest of the city of Naples (Map: Italy, J 7). It is delightfully situated in a plain that produces grain, vegetables, figs, and other fruit. It has a communal theatre. Population of commune, in 1881, 11,748; in 1901, 14,363.

GIULIANI, jō-lyâ'nê, GIAMBATTISTA (1818-84). An Italian philologist, born at Canelli (Piedmont). He was at different times professor at various colleges in Italy, and in 1860 was made professor of literature at the Istituto degli Studi Superiori of Florence, and a special chair was created for him as lecturer on Dante, of whose works he had made a careful study. Among his writings on this subject are: *Saggio di un nuovo commento della Commedia di Dante* (1845); *Le norme di commentare la Divina Commedia* (1856); *Metodo di commentare la Divina Commedia* (1861); and *Lettere sul vivente linguaggio della Toscana* (1858-65).

GIULIANO DA MAJANO, jō-lyâ-nô dâ mî-nô (1432-91?). A Florentine architect and sculptor in wood, of the Early Renaissance. He was born in Majano, and received his art education in Florence. There is much dispute about his life and work, because Vasari has confused him with Giuliano da Sangallo. We know from

documentary evidence that in 1465 he began the Church of Loreto; that in 1468 he rebuilt the Collegiate Church of San Gimignano; and in 1474 he began the Cathedral of Faenza. In 1477 he was made chief architect of the Cathedral of Florence. He was called to Naples in 1488 by King Alfonso of Aragon, for whom he built the fine Poggio Reale, now destroyed, and the Porta Capuana, one of the most beautiful gates of the Renaissance. He died at Naples after 1491. His best known work, however, is the Palazzo Strozzi, which ranks with the Pitti Palace (q.v.), among the finest palaces of the Early Renaissance in Florence. He was also famous as a sculptor in wood, having executed some of the finest intarsia work in Italy. His works in this line include: the doors of the Sala d'Udienza, in the Palazzo della Signoria, Florence; some decorations in the Sagrestia Nuova, in the Cathedral; the choir-stalls of the Cathedral of Perugia; an intarsia chest in the Cathedral of Loreto.

GIULIARI, jōō'lyā'rè, GIAMBATTISTA CARLO, Count (1810-92). An Italian historian of literature, born at Verona. He studied theology at Rome, and from 1856 until his death he was canon at Verona and librarian of the Biblioteca Capitolare in that city, where he devoted himself almost exclusively to literary work. He had the distinction of having established the first primary schools on Viennese models in his native city (1836). His principal works are: *Memoria bibliografica Dantesca* (1865); *Cinque discorsi dell' Alighieri dalla sua statua in Verona* (1865-68); *Storia della musica sacra in Verona* (1874-79); and *Istoria monumentale letteraria, paleografica della Capitolare Biblioteca di Verona* (1882).

GIULIA (jōō'le-à) **VILLA**, properly, **VILLA DI PAPA GIULIO**. A palace near Rome, built by Pope Julius III. (1550-55). It forms part of a complex of buildings, the *Vigna di Papa Giulio*, situated just to the north of Rome, near the Via Flaminia, and is one of the best examples of the High Renaissance at Rome. According to Vasari, he himself drew the original plans, which were revised by Michelangelo and carried out by Vignola. The villa, however, is probably due in the main to Vignola, but is inferior to his best work. This is especially evident in the façade, which shows repeated change of building plan. The main court is surrounded by semicircular arcades of the Ionic order; adjoining is another court built about a fountain. In the interior of the villa are fine frescoes by the brothers Zuccheri. After the death of Julius III., the building sank into decay, but it has been recently restored, and is now used as a museum of antiquities found outside of Rome. Its treasures are chiefly the results of the Etruscan excavations at Falerii.

GIULINI, jōō'le-né, **GIORGIO** (1714-80). An Italian historian and antiquary, born at Milan. His work on the mediæval history of Milan (1760), based on original research of twenty years, is marked by great learning.

GIULIO ROMANO, jōō'le-ò rô-mā'nò. An Italian painter. See **PIPPI**, **GIULIO**.

GIULIO ROMANO. An Italian singer and composer. See **CACCINI**, **GIULIO**.

GIUNTA, jōōn'tà. **GIUNTI**, jōōn'tè, **ZONTA**, zōn'tà, or **JUNTA**. A family of celebrated

Italian printers, originally from Florence. Two brothers, **LUCA ANTONIO** and **FILIPPO**, were booksellers in Florence as early as 1480; then the elder of the brothers went to Venice and founded a printing establishment which was continued after his death by his son **TOMMASO**, and his cousins. **FILIPPO** (1450-1517) started in Florence a printing house, celebrated for its editions of classics. His sons, **BENEDETTO** and **BERNARDO**, printed Boccaccio's *Decamerone* (1527). Other members of the family went to Rome, and several to Spain, where **GIULIO** and **TOMMASO** were printers to the King (1595-1624). Another, **JACQUES FRANÇOIS JUNTE**, founded a printing house at Lyons (1520), which lasted for a number of years.

GIUNTA PISANO, jōōn'tà pé'sā'nò (c.1202-58). The earliest Italian painter to emerge from the crowd during the period before Cimabue. He flourished between about 1202 and 1258 in Pisa, which was then the art centre of Tuscany. He signed and dated (1236) a "Crucifixion" (his favorite subject) formerly at San Francesco in Assisi. Some authorities attribute to him many of the frescoes in the Upper Church at Assisi, usually thought to be by Cimabue (q.v.). A "Crucifixion" at San Ranieri, an altarpiece in the public gallery, and a scene in the Chapel of the Campo Santo, all at Pisa, are attributed to him, but his work and life remain obscure. If he varies from the Byzantine School in giving dramatic action and pathos to his figures, they seem also to be exaggerated and coarse. Consult: Crowe and Cavalcaselle, *History of Painting in Italy*, vol. i. (London, 1864-66); Thode, *Franz von Assisi* (Berlin, 1885).

GIURGEVO, jōōr-jā'vò, Rum. **GIURGIU**, zhōōr'zhōō. A town of Rumania, in Wallachia, situated on the left bank of the Danube, opposite Rustchuk, 34 miles south-southwest of Bucharest, of which it is the port (Map: Balkan Peninsula, F 3). The chief landing-place for steamers is Smarda, about two miles distant. Giurgevo has a custom-house. The exports consist principally of grain, salt, and petroleum. The annual shipping exceeds 700,000 tons, a considerable portion of which is carried in Austro-Hungarian vessels. Population, in 1899, 13,978. Founded by the Genoese in the fourteenth century, Giurgevo subsequently became an important military post under the rule of the Turks, and was strongly fortified until 1829. During the wars between Russia and Turkey it was the scene of many engagements, and was taken repeatedly by the Russians.

GIURGIU, zhōōr'zhōō. See **GIURGEVO**.

GIUSTI, jōōs'tè, **GIUSEPPE** (1809-50). One of the most celebrated and popular of the modern poets and satirists of Italy, born in Monsummano, near Pistoja. Sprung from an influential Tuscan family, Giusti was early destined for the bar, and at Pistoja and Lucca began the preliminary studies, which were completed at the University of Pisa, where he obtained his degree of doctor of laws. On quitting Pisa Giusti was domiciled at Florence with the advocate Capoguidri, who subsequently became Minister of Justice, and here he first attempted poetry. Lyric compositions of the Romantic School, evincing both elevated and nervous thought, were his earliest efforts; but he speedily comprehended that satire, not idealism, was his true forte. In a

preëminent degree, Giusti possessed the requirements of the great lyrical satirist—terseness, clearness, and brilliancy. His writings exercised a positive political influence. When the functions of the press were ignored, and freedom of thought was treason, his verses in manuscript were in general circulation throughout Italy, and assisted in preparing the insurrection of 1848. Then for the first time did Giusti discard the pseudonym of 'the Anonymous Tuscan,' and append his name to a volume of verses, bearing on the events and aims of the times. In his political poems he abandoned the beaten track, and adopted many metrical forms instead of the conventional *terza rima* or unrhymed hendecasyllables. All his compositions are short pieces, rarely blemished with personalities, and written in the purest form of the popular Tuscan dialect. Giusti's writings are not only Italian in spirit and wit, but essentially Tuscan. A reverent student of Dante, Giusti himself often reaches an almost Dantesque sublimity in the higher outbursts of his wrath, while he stands alone in the lighter play of ironical wit. In politics an enlightened and moderate Liberal, Giusti was also beloved in private life for his social qualities and his loving and gentle spirit. He died in the dwelling of his friend the Marquis Gino Capponi, at Florence. His most celebrated pieces are entitled *Lo stivale*, or the history of a boot (Italy) a humorous narration of all the misfits, ill-usage, and patching allotted to this unfortunate down-trodden symbol of his country; *Gingillino*, a masterpiece of sarcasm, portraying the ignoble career of the sycophant; *Il Re Traviello*, or King Log; *Il Brindisi di Girella*, or the Weathercock's Toast, one of his best pieces, and the *Dies Iræ*, or funeral oration of the Emperor Francis I., written in condemnation of the atrocities committed in the fortress-prison of Spielberg. Several of Giusti's poems have been excellently rendered into English verse by W. D. Howells in *Modern Italian Poets* (1887), and into German by Paul Heyse in *Italienische Dichter*, vol. iii. (Berlin, 1887). Some of the editions of Giusti's *Poesie* are that prepared by Carducci (Florence, 1859; 3d ed. 1879), and several with comments, such as that of Fioretto (Verona, 1876 and since), and that of Bragi (Florence, 1890). Of his prose works, the *Epistolario*, or Correspondence, appeared in a second edition (Florence, 1885); the *Epistolario scelto*, with annotations by Giutini (Naples, 1892). The best biography of Giusti is that prepared by Carducci for his edition of the *Poesie*. Consult also: Carducci's essay on Giusti in his *Primi saggi* (Bologna, 1899); Biagi (editor), *Vita di Giuseppe Giusti* (Florence, 1893), an autobiography; Leonardis, *Il Giusti lirico e il Giusti satirico* (Genoa, 1887); Horner, *The Tuscan Poet Giuseppe Giusti and his Times* (London, 1864).

GIUSTINIANI, joo'stè-nyà'nè. An illustrious Italian family, distinguished in the annals of Venice and Genoa. MARCANTONIO GIUSTINIANI was Doge of Venice from 1684 to 1688, during which time the Venetians temporarily wrested the Morea from the Turks. VINCENZO GIUSTINIANI in the seventeenth century built a magnificent palace among the ruins of Nero's baths at Rome, and stocked it with treasures of painting and sculpture. He also formed a museum of antiquities, discovered on the spot. In 1807 the Giustiniani family conveyed the collection of paintings to

Paris, where they disposed of the greater part by auction, and privately sold the remainder, consisting of 170 fine paintings, to the artist Bonne-maison, who sold them to the King of Prussia. This fragment of the famous Giustiniani Gallery now enriches the Berlin Museum, and a very few of its former treasures are still to be found in the Giustiniani Palace at Rome.

GIUSTINIANI, LEONARDO (c.1388-1446). An Italian poet, born probably at Venice. A humanist and a translator from the Greek, he is best remembered for the *strambotti* and *canzonette* associated with his name. Some of the *canzonette* set to music by Giustiniani himself, and therefore called *Giustiniani*, were popular songs at banquets and upon festive occasions in general. Their subject-matter is erotic, their tone familiar, and their language full of dialectal peculiarities. Consult Wiese, *Poesie edite ed inedite di Leonardo Giustiniani* (Bologna, 1883).

GIVET, zhé'vâ'. A town in the Department of Ardennes, France, on both banks of the Meuse, about 23 miles from the Belgian town of Namur (Map: France, L 1). It was formerly a fortress of considerable strategical value, but in 1892 the fortifications were dismantled, and, with the exception of the citadel of Charlemont, converted into promenade grounds. The town contains a number of breweries, tanneries, pencil-factories, and marble-quarries. Population, 1901, 6947.

GIVORS, zhé'vôr'. A town in the Department of Rhône, France, on the Rhône and the Gier, 14 miles south of Lyons (Map: France, L 6). It contains numerous establishments for the manufacturing of bottles and window-glass, and there are important coal-mines in the vicinity. Population, in 1901, 12,132.

GIZZARD (from OF. *gezier*, Fr. *gésier*, gizzard, from Lat. *gigeria*, cooked entrails of poultry). A strong muscular portion of the alimentary tract, where hard solid food is broken up preparatory to digestion. Gizzards are found in various groups of animals, and have only a physiological likeness. The best known example is that of birds, which is the posterior compartment of the stomach, the front part being glandular and fitted to moisten the food to be crushed. The degree of development of the gizzard of birds depends upon the hardness of the food eaten. Grain-eating birds have the most powerful gizzards; insect-eating birds less powerful ones, while in birds of prey the gizzard is slightly developed. The great anatomist Hunter, indeed, believed that a strong gizzard could be cultivated in carnivorous birds by feeding them on grain, and this has been accomplished in the case of captive gulls. In the gizzard of birds small stones are frequently found, which are swallowed by the bird to aid in triturating its food. Among other animals in which a gizzard has been described are certain Rotifera, Bryozoa, the earthworm, the crayfish and its allies, and various insects, especially such as devour solid food. The 'gizzard' of insects and crustaceans is the fore-stomach or proventriculus; it is by some authors regarded as mainly a strainer. See BIRD; ALIMENTARY SYSTEM.

GIZZARD-SHAD (so called from the shape of its stomach). A name in Florida for the mudshad (q.v.). See PLATE OF HERRING AND SHAD.

GJALLAR, yäl'lär (Icel. *yeller*). The horn which, according to Scandinavian mythology,

Heimdal blows to notify the gods when a stranger is approaching the bridge Bifröst.

GJELLERUP, yel'le-ryup, **KARL ADOLF** (1857—). A Danish novelist, born at Roholte, Zealand. He became a warm advocate of German art and a devoted admirer of Richard Wagner, upon whose famous "Trilogy" he wrote the work entitled *Richard Wagner i hans Hovedværk Nibelungens Ring* (1890). Besides a collection of poems entitled *Min Kjærligheds Bog*, and the dramas *Brynhild* (1884), *Saint Just* (1886), *Thamyris* (1887), *En Arkadisk Legende* (1887), and *Hagbard og Signe* (1888), his works include several admirable tales of travel and the popular novels entitled *Det unge Danmark* (1879); *Germanernes Lærling* (1882); *Minna* (1898); and *Romulus* (2d ed. 1889). His dramas are not well adapted to the stage, because of the deficiency of the dialogues, but his lyrical verses and novels are popular.

GLACIAL DRIFT. See **DRIFT**.

GLACIAL PERIOD, PLEISTOCENE PERIOD, or ICE AGE. A division of geologic time, comprising the earliest part of the Quaternary period. The term gains its significance from a remarkable episode in which abnormal conditions of climate were involved. In late Tertiary times there seems to have been a gradual lowering of temperatures throughout the north temperate zone, and this change progressed steadily until at the opening of the Glacial period the climate was essentially arctic. Within the continental areas enormous glaciers and ice-sheets then formed which advanced southward, filling the river and lake basins, covering the mountains, and burying the lowlands beneath a vast *mer de glace*. One field of ice extended over Canada and the northeastern part of the United States. Its northern limits have not yet been defined, but on the east it reached the Atlantic Ocean, and southward it advanced well into New Jersey, Pennsylvania, and the States between the Ohio and Missouri rivers. New England, New York, and the region of the Great Lakes were completely covered by the ice-sheet. In the White Mountains the rocks bear evidence of having been striated and polished almost to the summits of the highest elevations, and the same phenomena have been recorded for the Adirondacks and Catskills, showing that the ice in places was several thousand feet thick. The mountains of Western North America were also the scenes of great glacial activity, of which the snow-fields of the present day are but wasted relics. Glaciers descended from the Rocky Mountains of Colorado and from the Sierra Nevadas of California far into the river valleys, while those of Alaska and British Columbia were so extensive as to form practically a single field.

The change in temperature seems to have been no less marked in the Old than in the New World. An ice-sheet covered the whole of Northern Europe; it filled up the basin of the Baltic on its way from Scandinavia to the plains of North Germany, and it crossed the North Sea to the Scottish Highlands, whence it moved northward and westward into the Atlantic. The whole of England north of the Thames, as well as Scotland and Ireland, was buried beneath the ice, which attained a thickness in some localities of 5000 feet. On the Continent the sheet spread over Scandinavia, Denmark, Holland, and parts

of Germany, Belgium and Russia, and comprised an area of about 800,000 square miles, or several times larger than the Greenland ice-cap. South of its limits there were smaller snow-fields and glaciers in the Carpathians, Alps, Jura, Pyrenees, and the Central Plateau of France. The present Alpine glaciers are shrunken remnants of the field that covered Switzerland during this period. The high mountain systems of Asia also show evidence of having been glaciated. In the Southern Hemisphere the glaciers of Patagonia were once enlarged so as to extend across the peninsula to the Atlantic shores, and New Zealand was overrun by the ice; but it has not been definitely established that the period of glaciation here was contemporaneous with that of the Northern Hemisphere.

EFFECTS OF GLACIATION. The general configuration of Continental lands has not changed appreciably since the opening of the Glacial period. The mountain systems had acquired their elevation before that time, and, in a general way, the drainage was directed toward the same channels that now carry the surface waters seaward. The ice exerted a powerful influence, however, upon minor land forms or types of scenery. In its progress from north to south and from highland to lowland it pushed along the soil and disintegrated rock, the accumulations of long periods of subaërial decay, and deposited them in great moraines, which still give a peculiar aspect to the scenery of glaciated regions. At the same time the sand and stones incorporated in the mass of moving ice were efficient agents of erosion; rock surfaces, wherever exposed, were smoothed and striated, prominences assumed a more rounded form, and the valleys were widened and deepened. The rock striations show that the direction of flow was influenced by mountain ranges of considerable elevation, although small inequalities in the surface caused no deviation. Most of the lakes in Northern Europe and America had their origin in this period. Lake basins were scooped out by erosion, and temporary lakes were formed by obstruction of valleys during the retreat of the ice-sheet. One of the largest temporary basins, which has been surveyed by means of the old beach lines, extended from the northern parts of Minnesota and North Dakota far into Canada, and covered an area exceeding that of all the Great Lakes combined. All lakes which are of pre-glacial origin show evidence of having been expanded during this period. The Great Lakes are bordered by a succession of terraces, the highest of which stand nearly 500 feet above the present water-level. The ice-sheet for a time stretched across the Saint Lawrence valley, turning the drainage of Lake Ontario into the Mohawk and Hudson; and Lake Michigan, obstructed at its outlet, overflowed toward the southwest into the Illinois River.

A further important result wrought during the Glacial period was the removal of the soil that had been derived *in situ* by weathering, and the substitution of a covering of 'drift' (q.v.). This glacial material was spread very unevenly over the land. In the Laurentian highlands of Canada, where the ice-sheet formed, the surface is bare rock or at most thinly covered with soil. Further south the drift accumulated along lines marking the advance and retreat of the ice in great heaps of boulders, gravel, sand, and clay. Such terminal moraines are strongly developed

in New England, New York, Ohio, and the Northern States as far west as Kansas. A second portion of the transported material was distributed beneath the ice-sheet as 'boulder-clay' (q.v.) or 'till,' in the form of a ground moraine. The boulder-clay is a compact, tenacious clay containing boulders of varying size and generally unstratified, although traces of bedding are sometimes present. It rests directly upon the rock, which is usually smooth and striated. The boulder-clay is distributed unevenly, gathering into smoothly arched ridges and mounds called 'eskers' and 'drumlins' (qq.v.), and at times thinning out so as to leave the rock formations exposed.

The extraordinary changes of climate indicated by the Glacial period led to migrations of the fauna and flora inhabiting the arctic and temperate zones. As the temperature fell, such animals as were unable to endure extreme cold worked southward, while some species found their way from the far north into regions from which they have long since disappeared; remains of the polar bear, reindeer, and Arctic fox occur in the glacial deposits of Southern Europe. With the retreat of the ice, the Arctic fauna and flora were able to adjust themselves to the changing conditions by withdrawing from southern latitudes or by ascending the slopes of mountains. The oscillation of the climate was thus accompanied by a variation of the life forms in each particular region.

DIVISIONS OF THE GLACIAL PERIOD. A detailed study of the Glacial deposits shows that they were not laid down continuously or under uniform conditions. On the other hand, the deposits are frequently divided into sections by intercalated beds of peat, and by stratifications of sands and gravels, which, as they could not have been formed beneath the ice-sheet, lead to the assumption that the ice advanced and retreated more than once. The evidences as to the number and extent of such fluctuations have not, as yet, been correlated successfully for different regions, and there is still much difference of opinion on the subject. Some geologists express the view that the Glacial period was divided into two epochs of cold, separated by an interval of mild temperature when vegetation flourished even in high latitudes. Others hold the opinion that there were as many as five epochs of glaciation and four inter-glacial intervals. A third opinion, which has many claims to consideration, limits the Glacial period to a single climatic revolution, marked by minor oscillations in temperature, and with local variations in ice movement.

CAUSES OF GLACIAL CLIMATE. Various theories have been proposed to account for the cold climate of the Glacial period. A sufficient cause may be found in terrestrial changes, such, for instance, as would lead to a variation in the distribution of land and water. The formation of glaciers is influenced by precipitation and thus by the proximity of warm waters to areas of cold land. It is conceivable that the poles may have been surrounded by a large land area which would exert a cooling effect upon the climate, and that the flow of ocean currents may have been so directed as to increase precipitation, but such a view is unsupported by geological evidence. A second theory, based upon terrestrial changes, ascribes the cold climate to a general elevation of the land surface in the north tem-

perate zone, possibly accompanied by a diversion of the Gulf Stream across the present Isthmus of Central America into the Pacific. This theory fails in the same particular as the first, i.e. there are no evidences of such great vicissitudes. While either of these theories would account for the cold, it is also difficult to bring them into consonance with the view now commonly accepted by geologists, that the Glacial period was marked by periodical variations in the climate. One of the most ingenious explanations that have yet been proposed is based upon the relative positions of the earth and sun at distant periods of time. It is known that the eccentricity of the earth's orbit is subject to secular variations. With a maximum of eccentricity the earth is 14,000,000 miles nearer the sun during perihelion than in aphelion, and the difference in the amount of direct heat received from the sun between these positions is about one-fifth. If now, by precession of the equinoxes, winter in the Northern Hemisphere should occur when the earth is in aphelion, the effect would be to lengthen this season by twenty-two days, and to shorten the summer by an equal period. This coincidence of maximum eccentricity with aphelion winter would undoubtedly result in the refrigeration of the climate in the Northern Hemisphere. This theory, developed by Dr. James Croll, is accepted by many eminent geologists of the present day as the most satisfactory explanation of the Glacial climate.

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GLACIER, glâ'shër or glâ's't-ër (Fr., from *glace*, Lat. *glacies*, ice). Many valleys of the Alps and of other high mountain ranges are filled with ice which extends from the snow-fields above to well below the tree-line. This mass of ice is called a glacier. The winter's snow, falling on the lower part of the glacier, melts away the following summer and exposes the ice, which also melts to some extent, and which, if there were not some source of supply, would entirely disappear. In the snow-fields above, the annual snowfall is not all melted in summer, and there is an accumulation of snow. It is evident that in time the snow would grow indefinitely high if there were no means of relief. The necessary relief is found in the flow of the ice, which carries off the surplus snow-fall of the snow-fields, consolidated into ice, to the lower part of the glacier. A glacier, therefore, has two distinct parts—a *reservoir*, where the snow is collected, and a *dissipator*, where the ice is melted. The line separating these two regions is usually

called the *névé*-line. We are thus led to the following definition: A glacier is a body of ice and snow formed in a region where the snowfall is greater than the waste, and flowing to a region where the waste is greater than the snowfall.

DISTRIBUTION. Whenever there is an annual snowfall greater than the annual waste, glaciers must exist. We find them on all high mountains subject to moist winds, such as those on the western coast of North and South America, the Scandinavian mountains, the Alps, the Pyrenees, the Caucasus, the Himalayas, and the mountain chains to the north, and the New Zealand Alps. One glacier is known in Mexico, on Mount Iztaccihuatl, and a number in equatorial Africa, on Mount Kenia, on Mount Kilimanjaro, and on the Ruwenzori range. In the Arctic regions Grinnell Land, Greenland, Iceland, Jan Mayen Land, Spitzbergen, and Franz Josef Land are more or less covered with glacial ice; and the Antarctic lands are almost entirely ice-covered.

CLASSIFICATION. Glaciers may be divided into the following classes:

(1) Continental glaciers, or inland ice, such as the great masses of ice that cover Greenland and the Antarctic Continent. (2) Plateau glaciers, or local ice-caps, are similar to Continental glaciers, but are of comparatively small extent. Examples of this class are found in Norway, in Spitzbergen, and on the borders of Greenland. (3) Alpine glaciers, the more familiar forms, which occupy valleys. (4) Piedmont glaciers. This form occurs when Alpine glaciers debouch and spread out on a plain. The best example is the Malaspina glacier, at the foot of the Saint Elias Alps in Alaska. (5) Hanging glaciers, which rest on shelves on the mountain side. They are usually small and steep. (6) Débris glaciers (*glaciers remaniés* of the French), formed not from snow, but from ice falling from a higher glacier. They are usually small and unimportant.

Glaciers may be complete or incomplete. A complete glacier has a reservoir where the snow is accumulated and a dissipator where the ice is all melted; an incomplete glacier either has its ice supplied directly, as in class 6, or loses some of its ice at the lower end by breakage, as in glaciers which break off at a cliff, or those which reach the sea and form icebergs.

MOTION. If a glacier is in equilibrium—that is, neither growing larger nor smaller—the ice annually flowing through any cross-section of the glacier must exactly equal the total annual accumulation above and the waste below that section. As the accumulation above and the waste below a section through the *névé*-line is greater than for any other section, the flow, under uniform conditions, is the greatest there; and it is less and less through sections more and more distant from the *névé*-line, whether they are higher in the reservoir or lower in the dissipator.

That the ice of glaciers is in motion down the valley has long been known, both from the observation that large stones are carried down on the surface of the ice and from the general reasoning given above. It was not, however, until Agassiz and Forbes began their classical researches that any quantitative value of the motion of the ice was obtained. Since then many measurements have been made on various gla-

ciers, and we now have a fair knowledge of this matter. It has been found that at any section the velocity of the ice is greatest at the centre and diminishes as we approach the sides. When, however, a glacier has a sinuous course, the greatest velocity is not in the exact centre, but is displaced toward the convex side, so that the line of maximum velocity is more sinuous than the glacier itself. The velocity diminishes also from the surface of the ice toward the bed of the glacier. The observations on which this statement rests are neither numerous nor satisfying; nevertheless, they are sufficient to establish the fact. It will appear that, as Forbes said, the flow of a glacier is very much like that of a river; if we consider a river which is flowing into a sandy region, where the water is gradually lost by seepage, the analogy is still more striking. In valley glaciers of fairly uniform slope the velocity is greatest at the *névé*-line and diminishes as we ascend or descend from there. This law is subject to many exceptions; if the valley contracts in descending, there must be an increase in velocity; if the slope of the valley increases, this will also increase the velocity; in glaciers which reach the sea and break off in bergs the velocity increases as we approach the end, as a result of the lack of support in front. There is also a slight movement into the glacier in the reservoir, which is greatest where the accumulation is greatest, and one toward the surface in the dissipator, which is greatest where the waste is greatest. As to actual values in velocities, we find that the Mer de Glace has the greatest velocity of any glacier in the Alps, its maximum amounting to 35½ inches a day. The greatest velocity of the Aletsch, the largest glacier of the Alps, is 20 inches a day. For other Alpine glaciers we find various velocities down to an inch or two a day, or even less for the smaller ones. Of larger glaciers, the Muir in Alaska has a velocity of about seven feet, near where it reaches tide-water; and one of the larger ice-streams of Greenland, the Upernivik, was found to have a velocity of 99 feet a day at one point near its end.

CAUSE OF GLACIAL MOTION. Many theories have been advanced to explain why the ice of glaciers, which is apparently so very brittle, should flow like a plastic substance. There are two questions to be answered—namely, What is the force causing the ice to move, and what property of ice enables it to move as it does? There is a general unanimity at present in the belief that the weight of the ice itself is the only force causing the motion, but there is not so much unanimity in answering the second question. Three explanations still hold their ground: First, according to Forbes and Rendu, the ice, in spite of the fact that it is very brittle to any rapid change of shape, is truly plastic to slow changes; just as shoemaker's wax will break under a sharp blow, but will allow a bullet by its own weight to sink slowly through it. This has been abundantly proved by the experiments of Pfaff, Andrews, Main, McConnell, and Kidd. Experiments on single ice-crystal show that the crystal is plastic in planes at right angles to the optic axis. This is the *plastic* or *viscous* theory. Second, Tyndall considered ice to be devoid of true plasticity, but thought that in a glacier it is continually shattered and refrozen. He was led to this idea by the fact which Faraday dis-

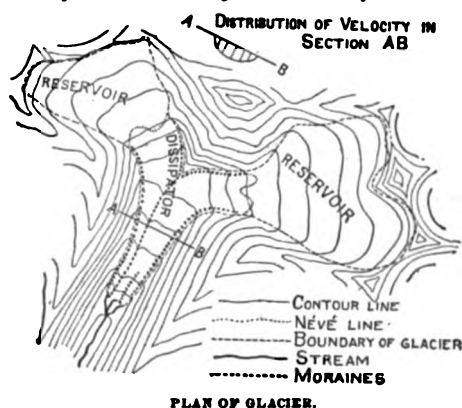
GLACIERS



1. Forno Glacier, Switzerland.

2. Sebree Island, Glacier Bay, Alaska, showing rock glaciated by Muir Glacier when it was larger.

covered, that two pieces of ice when brought into contact will freeze together. He showed by many experiments that ice could be crushed and forced through curved tubes and come out clear ice, the fragments having entirely coalesced. This is the *fracture and regelation* theory. Third, James Thomson discovered that the freezing-point of ice is lowered $.0075^{\circ}$ C. from an increase of one atmosphere of pressure, and applied this fact to the explanation of glacial motion. He supposed that at any point, where, by the movement of the ice, the pressure becomes a little greater than the average, the freezing-point will be lowered and a small amount of ice melted; the pressure being thus relieved, the ice will move slightly, and the pressure will be transferred to other points; the water thus formed will be squeezed through crevices in the ice to other points where the pressure is less, and will there freeze. A continuation of this process will result in the general progression of the ice down its valley. This is the *pressure and regelation* theory.



CREVASSES. Although the ice of glaciers can suffer some distortion without breaking, if the rate of distortion is too great the ice will crack and great crevasses form. Crevasses can be divided into distinct classes: *Marginal* crevasses, which occur on the sides of glaciers and point upstream at an angle of about 45° ; they are the result of increasing velocity from the sides to the centre of the glacier. There must also be a tendency to the formation of crevasses at the bottom of the glacier pointing up-stream, but it is extremely probable that the weight of the ice is sufficient to prevent their forming except occasionally very near the end of the glacier. *Transverse* crevasses are formed when the slope of the bed increases. *Longitudinal* crevasses form near the end of the glacier, especially when the ice spreads out on a plain; they are due to the pressure of the ice behind and are usually arranged radially. Irregular crevasses may be formed as the result of some irregularity in the bed of the glacier. There is usually a very large crevasse, called the *bergschrand*, at the upper margin of the reservoir; it is due to the more rapid motion of ice of the reservoir pulling it away from the ice clinging to the mountain slopes. In the dissipator the crevasses are in full view, but in the reservoir they are frequently covered with snow; this makes traveling above the snow-line very dangerous, except for parties of several persons properly roped together. When

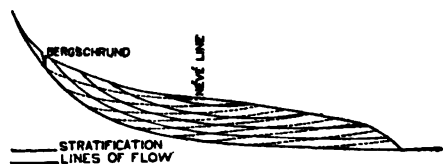
crevasses first form they are mere cracks, which afterwards widen out as the result of the motion of the ice and the melting of their sides, until they sometimes are fifty or even a hundred feet wide. They may be half a mile or more in length, but the great depths which they are supposed to reach are exaggerated; they are rarely so much as 200 feet deep, and probably never as deep as 300 feet.

MORAINES. The rocks and debris which fall upon the surface of the glacier and are carried down by it, and the material pushed along under the ice, are called *moraines*. They cannot be seen in the reservoir, as they are there covered by the snow, but they are very striking features of the dissipator. *Lateral* moraines are formed by the rocks falling from the mountains upon the sides of the glacier. When two tributary glaciers unite to form a trunk glacier, two of the lateral moraines unite to form a *medial* moraine, which from a distance looks like a great dark line drawn upon the surface of the white ice marking out the direction of motion. The ice under the moraine, being protected from the air and sun, does not melt as rapidly as the unprotected ice, and, therefore, is left by the general waste of the surface as a great ridge rising sometimes a hundred feet above the general level of the ice. *Reservoir* moraines, so called from their origin, are formed by material falling upon the reservoir where it is covered by the snow and later brought to the surface of the dissipator by the motion of the ice and the melting. Moraines which can hardly be distinguished from reservoir moraines may sometimes be formed from the material plucked from a projecting point in the bed of the glacier and carried along in the body of the ice, to be exposed later at the surface by the melting. The material pushed along under the ice is called the *ground moraine*; it is made up of debris fallen under the glacier at the sides or through crevasses or the *bergschrand*, and material plucked from the bed of the glacier.

STRUCTURE OF THE ICE. The origin of the glacial ice is the snow that falls in the reservoir. By thawing and freezing, this soon changes into a turbid ice filled with many air-bubbles. Crystallization starts from numerous centres, around which the molecules of ice gradually rearrange themselves until the whole mass is made up of crystals of clear ice (though still containing many air-bubbles) with their respective optical axes turned in various directions. The crystals at this stage are about the size of peas and adjoin each other in surfaces which bear no relation to the geometric crystalline faces. By a process of recrystallization some of these crystals grow at the expense of their neighbors until finally many of them become four or five inches in diameter. During this process the ice is moving down the valley, so that we find the crystals of increasing age, and therefore increasing size, mixed in with smaller ones as we go from the *névé*-fields down the glacier. The sun's rays penetrating the ice for a short distance melt the ice along the junctions of the crystals, which can then readily be separated. The sun's rays also cause melting in the interior of the crystals at various points; the cavities thus formed are flat disks or six-angled stars; as the water occupies less space than the ice from which it was melted, each of these cavities contains a small vacuum which is

more easily visible than the sides of the cavity. These cavities are known as Tyndall's figures, and always lie with their flat sides at right angles to the optical axis of the crystal, whose direction may thus be easily determined.

STRATIFICATION AND BANDED STRUCTURE. On the sides of crevasses in the reservoir the layers of hardening snow, due to successive seasons, can be readily distinguished, and the outcrops of these strata can be followed for a short distance into the dissipator; but their appearance soon changes, and the majority of observers claim that as the ice becomes consolidated the marks of stratification are obliterated. In the lower part of the dissipator, where the ice is thoroughly consolidated, it is found to be composed of bands of bluer and whiter ice, the color being caused by the amount of the contained air-bubbles.



LONGITUDINAL SECTION OF GLACIER.

These bands, as described by Forbes and others, follow the general shape of the bowl of a spoon pointing down-stream. Each tributary has its own system of bands, though but one system is usually found at the end of the glacier. They are prominent at the sides, near the end, and at the line of junction where two glaciers unite. Three explanations have been given of their origin. Agassiz considered them the modified form of stratification. Forbes looked upon them as surfaces where the principal amount of differential motion took place. Tyndall thought they were caused by pressure and were analogous to the slaty cleavage of rock. Forbes's idea has been practically discarded, and glacialists are divided between the explanations of Agassiz and of Tyndall.

TEMPERATURE. Theory, and, so far as they go, observations indicate that the body of the glacier is at the temperature of melting ice.

VARIATIONS. The relative sizes of the reservoir and dissipator are determined by the condition that the accumulation in the first must equal the waste in the second. The accumulation depends upon the size of the reservoir and the snowfall, and the waste on the size of the dissipator and the rate of melting. The melting is due principally to direct radiation from the sun and to condensation of water vapor from the air; it will readily be seen that in cold wet periods glaciers will advance, and in warm dry periods they will retreat. Glaciers are, therefore, indicators of climatic variations. In the last twenty years much attention has been given to the study of the variations of glaciers. It has been discovered that in the Alps the glaciers have made no permanent change within the last three hundred years, but that they have grown larger and smaller in size, making a complete fluctuation on the average once in thirty-five years. Records of the glaciers of Iceland and of Scandinavia show that in the seventeenth century they were much smaller than they are at present; early in the eighteenth century a general advance began which continued well into the nineteenth century, and

was characterized by a very marked increase in the extent of the ice; since then there has been a small retreat. The same general order has been followed in southeastern Alaska, though the dates cannot be definitely determined. It is probable that the glaciers of other Arctic regions have experienced similar variations. With few exceptions, the glaciers in all parts of the world are now in retreat.

WORK OF GLACIERS. The moraines are carried along by the glaciers and deposited on the sides of its valley and at the end of the ice. Some rocks become imbedded in the ice and act like graving-tools in making long, straight scratches in the bed-rock, whose surface is also smoothed by finer material moved by the ice. A region which has been covered by a glacier usually shows smooth and rounded rock surfaces marked with parallel scratches; heaps of rocks, more or less angular, and dumped irregularly about, frequently forming small lakes. These rocks are often of a different kind from the underlying country rock, showing that they have been transported from a distance, and their angular or subangular forms show that they have not been transported by water. They are called *erratics*. Among them some will have smoothed and scratched surfaces. It is by studying the distribution of scratches, smoothed surfaces, and erratics, that geologists have been able to show the existence of a former ice age when large parts of Europe and of North America were covered by great sheets of ice.

The power of glaciers to erode valleys or lake basins has been greatly discussed, without a conclusion commanding general assent being reached. Leading geologists entertain diametrically opposite opinions on this subject.

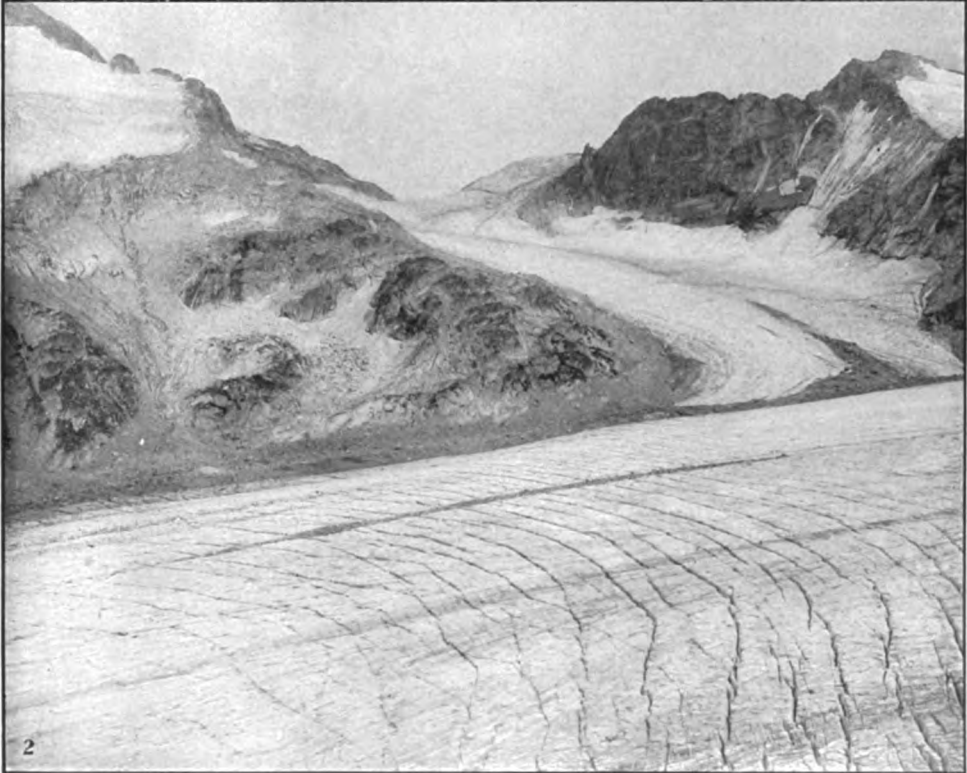
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GLACIER BEAR. The small gray bear (*Ursus Emmonsii*) of the Saint Elias Alps, Alaska. See BEAR.

GLADBACH, glät'băc, or **BERGISCH-GLADBACH**, bër'gësh-. A town of the Rhine Province, Prussia, eight miles northeast of Cologne (Map: Germany, B 3). It produces paper, machinery and other iron products, powder, brick, etc. Population, in 1890, 9538; in 1900, 11,435.

GLADBACH, or **MÜNCHEN-** (mūn'ken) **GLADBACH.** A manufacturing town of the

GLACIERS



FORNO GLACIER

1. Reservoir showing the névé line, outcrop of the strata and crevasses.
2. View showing moraines.

Prussian Rhine Province, 16 miles west of Düsseldorf (Map: Germany, B 3). The Münsterkirche is a fine old structure with a Gothic choir dating from the twelfth century, and an eighth-century crypt. There are three monasteries, a synagogue, and a teachers' seminary. Gladbach is the centre of a textile industry in the Rhine Province. There are numerous spinning, weaving, and dyeing establishments, foundries, machine-shops, book-binders, and many establishments for the manufacture of soap, shoes, chocolate, confectionery, wagons, brushes, paper, leather, furniture, etc. The number of persons employed in the manufacturing of the town is over 16,000. Gladbach had its origin in the Benedictine abbey founded originally in the eighth century, and abolished at the beginning of the nineteenth. Population, in 1890, 49,628; in 1900, 58,023; including over 9000 Protestants.

GLADDEN, WASHINGTON (1836—). An American clergyman and writer, born in Pottsgrove, Pa. He prepared for college at the Owego Academy, in Owego, N. Y., and graduated at Williams in 1859. He was pastor of Congregational churches in Brooklyn, N. Y., Morrisania, N. Y., North Adams, Mass., and Springfield, Mass., from 1860 until 1882, when he removed to Columbus, Ohio, to become pastor of the First Congregational Church there. As an editor he was connected with the *Independent* from 1871 to 1875, and with the *Sunday Afternoon* (Springfield, Mass.) from 1878 to 1880. He was given the degree of D.D. by Roanoke College, Virginia, and LL.D. by the University of Wisconsin and Notre Dame University, Indiana, a Catholic institution. His pulpit and published utterances show vigorous, direct, and practical thought, and the gift of graceful expression, and he put into practice his repeated expression about the duties of citizenship by serving in the City Council of Columbus from 1900 to 1902. His books, which are sensible and scholarly discussions of social and civil reform, and of the application of Christianity to every-day life, include such titles as: *Plain Thoughts on the Art of Living* (1868); *Workingmen and Their Employers* (1876); *Being a Christian* (1876); *The Christian Way* (1877); *The Lord's Prayer* (1880); *The Christian League of Connecticut* (1883); *Things New and Old* (1884); *The Young Men and the Churches* (1885); *Applied Christianity* (1887); *Parish Problems* (1888); *Burning Questions* (1889); *Who Wrote the Bible?* (1891); *Santa Claus on a Lark* (1892); *Tools and the Man* (1893); *The Cosmopolis City Club* (1893); *The Church and the Kingdom* (1894); *Ruling Ideas of the Present Age* (1895); *Seven Puzzling Bible Books* (1897); *Social Facts and Forces* (1897); *Art and Morality* (1897); *The Christian Pastor* (1898); *How Much is Left of the Old Doctrines* (1899); *Social Salvation* (1902); and *The Practice of Immortality* (1902). He also wrote the discussion of the Christian religion, "The Outlook for Christianity," in *Great Religions of the World* (1902).

GLADHEIM, glád'hím (Icel., bright abode). In Norse mythology, the dwelling-place of Odin, the largest and noblest of edifices. In this home is Valhalla (the hall of heroes), radiant with gold, to which are conducted all who fall in battle. The ceiling is formed of spears, the roof of shields, and the benches are strewn with coats of mail. According to the *Elder Edda* it has 540

gates, through each of which 800 men can go abreast.

GLADIATOR (Lat., swordsman). One who in antiquity fought in the arena, at the amphitheatre in Rome, and in other cities, for the amusement of the public. The gladiators were generally slaves, bought and trained for the purpose, by masters who made this their business. The custom is supposed to have been borrowed from the East, and to have had its origin in the practice of human sacrifices, or that of taking the lives of captives or prisoners of war, in honor of heroes who had died in battle.

After a time all considerable funerals were solemnized by human sacrifices, which took the form of combats, in which, to increase the interest of the spectators, the prisoners were required to sacrifice each other; and as prisoners, and afterwards other slaves, were kept for this purpose, they were trained to fight with skill and courage, to make the spectacle more impressive. These contests first took place at funerals, but afterwards in the amphitheatre, and in process of time, instead of a funeral rite, became a common amusement. The first we read of in Roman history was the show of a contest of three pairs of gladiators, given by Marcus and Decimus Brutus, on the death of their father, in the year B.C. 264. In the year B.C. 207 a show of twenty-two pairs was given in the Forum. In B.C. 217 the first Scipio Africanus diverted his army at New Carthage with a gladiatorial exhibition. The fashion now rapidly increased. Magistrates, public officers, candidates for the popular suffrages, gave shows to the people, which consisted chiefly of these encounters. The emperors exceeded all others in the extent and magnificence of these spectacles. Julius Cæsar gave a show of 320 pairs; Titus gave a show of gladiators, wild beasts, and sea-fights for 100 days; Trajan gave a show of 123 days, in which 2000 men fought with and killed each other, or fought with wild beasts for the amusement of the 70,000 Romans, patricians, and plebeians, the highest ladies and the lowest rabble, assembled in the Coliseum. A vast number of slaves from all parts of the world were kept in Rome, and trained for these exhibitions. There were so many at the time of Catiline's conspiracy that they were thought dangerous to the public safety, and it was proposed to distribute them among the distant garrisons.

Efforts were made to limit the number of gladiators, and diminish the frequency of these shows. The Emperor Augustus forbade more than two shows in a year, or that one should be given by a man with a property of less than half a million sesterces; but it was difficult to restrain what had become a passion, and men even had such contests for the amusement of their guests at ordinary feasts.

These shows were announced by show-bills and pictures, like the plays of our theatres. The gladiators were trained and sworn to fight to the death. If they showed cowardice, they were killed with tortures. They fought at first with wooden swords, and then with steel. When one of the combatants was disarmed, or upon the ground, the victor looked to the Emperor, if present, or to the people, for further directions: if they turned up their thumbs, the act signified death; contrary to the popular notion, mercy

was indicated, not with the thumbs at all, but by a waving of handkerchiefs. A gladiator who had conquered was rewarded with a branch of palm, and sometimes with his freedom. Though the gladiators at first were slaves, freemen afterwards entered the profession, and even knights. Senators and knights fought in the shows of Nero, and women in those of Domitian. The Emperor Constantine prohibited the contests of gladiators, A.D. 325; but they could not at once be abolished. In the reign of Honorius a monk, Telemachus, went into the arena to stop the fight, but the people stoned him. They were finally abolished by Theodoric (A.D. 500).

GLADIATOR, THE. A tragedy by Robert Montgomery Bird (1841), in which Edwin Forrest frequently took the part of Spartacus.

GLADIATORS' WAR. See SPARTACUS.

GLADIOLUS (Lat., diminutive of *gladius*, sword; so called from the form of the leaves). A genus of plants of the order Iridaceæ, with a tubular perianth, the limb of which is divided into six unequal thread-like segments; the stamens are undivided; and the seeds are winged. The roots are bulbous; the leaves linear or sword-shaped. The Cape of Good Hope produces the greater number of the known species, as also several allied forms once included in this genus. A few, however, are natives of other countries, and two or three are found in Europe. Most of the species have flowers of great beauty; and some of them are among the finest ornaments of flower borders and greenhouses. They are propagated either by seed or by offset corms; and in the former way many new varieties have been produced. In the garden culture of gladiolus the corms are planted out in early spring, preferably in sandy loam soil. The flowers open in July and August, and the blooming season can be prolonged by successive plantings in spring and early summer. In the fall the corms are dug and kept in a cold cellar over winter. Some very remarkable hybrids have been produced by Lemoine in France and by Groff of Canada. Formerly Southern Europe supplied the world with gladiolus, but the United States supplies the great bulk of the crop. The gladiolus fields of Long Island, N. Y., are perhaps the most noted in the world.

GLADSTONE, HERBERT JOHN (1854—). An English politician, fourth son of William Ewart Gladstone. He was born in London, was educated at Eton and at University College, Oxford; was lecturer on modern history at Keble College from 1877 to 1880, and was private secretary to his father in 1880-81. From 1881 to 1885 he was Junior Lord of the Treasury, and subsequently acted as financial secretary of the War Office (1885). Under Home Secretary (1892-94), and First Commissioner of Works (1894-95). He was a member of Parliament for Leeds from 1880 to 1885, since which time he has represented Leeds, West.

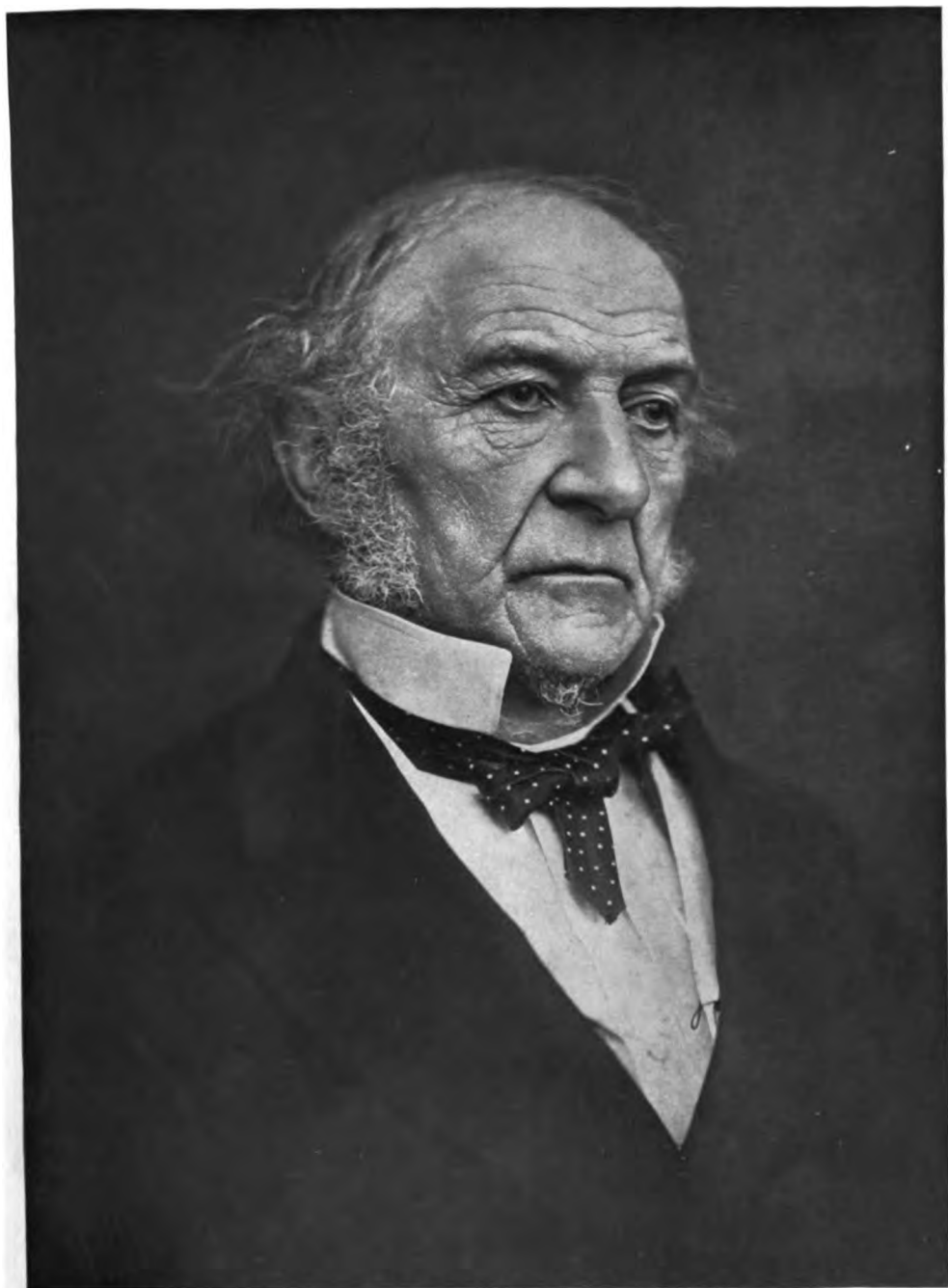
GLADSTONE, WILLIAM EWART (1809-98). A British statesman. He was born December 29, 1809, of Scotch parentage, in the city of Liverpool, where his father was a wealthy merchant, a member of Parliament, and a baronet. In 1821 he was sent to Eton, and in 1828 he entered Christ Church College, Oxford. Both at Eton and Oxford Gladstone was distinguished for ap-

plication to his studies, for his religious tendencies, his love of outdoor life, and his fondness for oratory and debate. He was successively secretary and president of the Oxford Debating Union, and in that society he delivered a powerful oration against the Reform Bill, which had been introduced into the House of Commons in 1831. In that year he took a double first in classics and mathematics.

Gladstone left Oxford in the spring of 1832, and after spending six months in Italy, entered Parliament as a member for Newark. The House of which he was a member was the first to be seated under the Reform Bill, which he had attacked while in college. He naturally attached himself to the Tory opposition under Sir Robert Peel, and waited for that party to come into power to win advancement. He delivered his maiden speech on June 3, 1833, in vindication of his father from charges brought against him concerning his conduct toward the slaves on his plantation in Demerara. In the last week of 1834 Peel came into power, and in January, 1835, appointed Gladstone First Junior Lord of the Treasury, and in the following month Under-Secretary for the Colonies. The Parliament elected in February, however, had a Liberal majority; on April 8th the Tory Government went out and Gladstone again became a private member, which he remained until 1841, when, on Sir Robert Peel's coming back into power, he was appointed vice-president of the Board of Trade and Master of the Mint. In May, 1843, he became president of the Board of Trade, and so gained his first seat in a Cabinet. Both as vice-president and as president he took a leading share in the work of reforming the tariff, and thus got his first lesson in finance. Already he gave unmistakable signs of genius in this direction, both in the work of arranging schedules and in the defense of his proposals on the floor of the House in exposition and debate. For a moment he endangered his career by resigning his office through uncertainty as to the support he should give an important Government measure concerning an increased grant to Maynooth College, the Irish training school for Catholic priests. To Gladstone this seemed opposed to the principles he had supported in a book on the relations of the Church and State, published by him in 1839, in which he had stood for a single Church establishment under the control of the State, of which it should be the conscience. Rather than run the risk of compromising himself before his own conscience he resigned his office (January 28, 1845) and became once more a private member of the House.

In December, 1845, he was appointed by Peel to the office of Colonial Secretary. To accept this he had to vacate his seat. This was the one break in a Parliamentary career extending over more than half a century. Gladstone now gave Peel his assistance in formulating his free-trade measures which led to the repeal of the Corn Laws in 1846. In 1847 Gladstone resumed his seat in the House as Tory member for Oxford. In 1850 Peel died, and the first period in Gladstone's career, the period of apprenticeship to this great master, was terminated.

The new period extending from 1850 to 1868 may be called Gladstone's period of independent political reform. In 1852 he first came into conflict with his great rival, Disraeli, whose budget in that year he completely annihilated, thus



WILLIAM EWART GLADSTONE
FROM A PHOTOGRAPH TAKEN IN 1896

bringing about the fall of the Derby Ministry (December 17th). In 1853 he presented his own first budget as Chancellor of the Exchequer in Aberdeen's Coalition Cabinet, and scored the first great personal triumph of his career. This budget was a masterpiece of equable and efficient taxation. It increased the revenues of the State and placed the burden of the impositions where they could best be supported. His plans, however, especially in the matter of the income tax, which he was proposing by gradual steps to abolish completely, were somewhat interfered with by the intervention of the Crimean War, which demanded a new budget with increased taxation. In this budget Gladstone insisted that all the funds needed for the prosecution of the war should be raised by taxation, and not by the negotiation of loans. The conduct of the war, however, hurt the prestige of the Aberdeen Government, and on January 29, 1855, the Ministry resigned. But Gladstone was the 'inevitable' Chancellor for any administration, and he accepted the same office in Lord Palmerston's Cabinet, resigning it, however, at the end of three weeks. He remained out of office for three years, during which time he published his *Studies on Homer* (1858), and undertook a mission to the Ionian Islands, where a strong agitation was being carried on for the cessation of British rule and annexation to Greece. In 1859 he returned to the Exchequer in the Cabinet of Lord Palmerston, and in 1860 and 1861 he issued budgets that were marvels of financial statesmanship. He had now allied himself completely with Bright and Cobden, the latter of whom he had heartily supported in his attempt to negotiate a commercial treaty with France. This was accomplished in January, 1860. By his masterly tactics Gladstone won a complete victory over the House of Lords in 1861 after it had defeated his measure for the abolition of the tax on paper in the previous year. This was a great victory for popular education and the free press, and from that time dates the era of cheap newspapers for the people in England.

In July, 1865, Gladstone was defeated for Parliament at Oxford, but was returned from South Lancashire. Lord Russell became head of the Ministry, and made Gladstone Chancellor of the Exchequer and leader in the House of Commons. In 1866 Lord Russell brought forward his first bill for the extension of suffrage and the redistribution of seats in the House of Commons. The support of this measure marks the beginning of Gladstone's adhesion to the Liberal Party, toward which he had long been tending. His acceptance of office under Palmerston while still professing Tory principles was the first step in this direction. His defeat by his Oxford constituents because of his Liberal affiliations and tendencies strengthened his resolution to make his abandonment of Toryism definite. As for the bill itself, Disraeli and others united to defeat it, and the Liberal Government was forced to resign (June 19th). Lord Derby and Disraeli on their accession to power introduced another reform bill even more radical than that of Gladstone, who gave the new measure his hearty support, helping to carry it through in 1867.

In December, 1867, Gladstone succeeded Lord Russell as leader of the Liberal Party. In this capacity he vigorously assailed the Conservative Ministry, which after February 26, 1868, was

headed by Disraeli. In November the Ministry appealed to the country on the question of the disestablishment of the Irish Church, which had been made by Gladstone a party issue, and in the new Parliament the Liberals gained an overwhelming majority. On December 4, 1868, Gladstone became Prime Minister, and started in at once on a campaign of reform in Irish affairs. The disestablishment of the Irish Church was effected in July, 1869, after a bitter struggle in the House of Lords. The next thing he essayed was to reform the Irish land system. This bill, though moderate in character, was nevertheless a step forward in the direction of giving the tenants more rights and keeping them from being crushed at pleasure by their landlords. This bill was carried in 1870. He also sought to establish an Irish National University that would satisfy the just demands of the Catholics of Ireland. This measure was defeated and he resigned (March, 1873). Disraeli refused to form a Ministry, so Gladstone was forced to resume office for a time, though his strength was insufficient to carry any important reform measure. In 1874 he called for a dissolution in order to increase, if he could, the strength of his party in the House by a general election. The election brought defeat instead, and Disraeli returned to power. Gladstone, wearied with the weight of affairs, resigned his leadership and retired from official life to carry on a controversy over the Vatican decrees recently promulgated by the Pope, and destined, as Gladstone thought, to weaken the allegiance of English Catholics to their sovereign.

It was the news of the Bulgarian horrors (1876) that brought Gladstone once more into public life. By his speeches and pamphlets he aroused public feeling to the highest pitch of excitement, and throughout the Russo-Turkish War he denounced the pro-Ottoman policy of Lord Beaconsfield, acting once more as the leader of his party. On the issue of the Russo-Turkish War the Liberals carried the country in 1880, and Gladstone, elected from Midlothian, on April 23 became Prime Minister. Gladstone now resumed his position at the head of the Liberal Party. He started in at once to continue the work of his first Ministry. He introduced a second Irish Land Bill, which was thrown out of the House of Lords. Ireland began to grow impatient, and the Nationalist leaders in Parliament restive. The Home Rule movement took a new lease of life under Parnell, Dillon, and others, but as yet Gladstone had nothing in common with their cause. His Ministry lost prestige in the conduct of affairs both in Ireland and abroad. The Phoenix Park murders (1882), followed by repressive legislation on the part of the Government, alienated the Irish members in Parliament. The defeat of Majuba Hill (1881), and the generous terms of peace conceded the Boers, aroused public dissatisfaction. The failure to relieve Khartum, and the tragic death of General Gordon (1885), were fatal blows to the Ministry. On June 8, 1885, Gladstone resigned and was succeeded by Lord Salisbury. The elections of November showed a slight preponderance of Conservatives and Parnellites over Liberals. To gain the support of the latter, Gladstone announced his adhesion to Home Rule; the Conservative Government was overthrown, and on February 1, 1886, Gladstone

succeeded to the Premiership for the third time. In April a Home Rule bill was brought into Parliament. (See HOME RULE.) The measure met with opposition from all sides. The Irish members objected to the clause which deprived Ireland of representatives to the Imperial Parliament. A serious defection occurred in the Liberal ranks, Lord Hartington and Mr. Goschen refusing to support the Government, and being supported in their action by John Bright and Joseph Chamberlain. On June 7th the bill failed to pass a second reading, 93 Liberal votes being cast against it. Parliament was dissolved on June 26th, but the elections resulted in the decisive defeat of the Liberal Party, and on July 20th the Ministry resigned. The elections of 1892 showed a majority of 40 for Home Rule, and on August 15th began Gladstone's fourth and last Ministry. In 1893 a new and amended bill was brought before the House, and Gladstone, making the last great official fight of his life, triumphantly carried it. The House of Lords, however, threw out the measure (September 8th), and the last stage of Gladstone's life work ended in apparent failure. Weary of the tumults of Parliamentary life, he laid down his office on March 3, 1894, being succeeded by his colleague Lord Rosebery.

The last participation of Gladstone in public affairs was in connection with the Armenian massacres in 1896. He addressed meetings throughout the country and aroused public feeling, as he had done in 1876 over the Bulgarian atrocities. In 1898, on the 19th of May, he died in the eighty-ninth year of his life. He lies buried in the statesmen's corner of Westminster Abbey.

Gladstone was the greatest of the long line of Victorian political leaders and prime ministers. His only rival was Disraeli; but he had moral qualities which Disraeli lacked, and these more than made up for the superior brilliancy of the other, who looked with some contempt on Gladstone's principles and seriousness. Gladstone has been called an opportunist, and it is true that he more than once changed his position and went over to those against whom he had fought previously; but for any one who has studied Gladstone's career carefully these changes were not without a law of their own in Gladstone's intellectual development. Each change bore a relation to a previous change, and viewing his career in the large we perceive a steady, gradual, and consistent progress. This is more than can be said of Disraeli, who, reversing his position quite as completely as Gladstone, did it to serve his own private ambitions. Gladstone cared too little for power, refused office too often, and increased the anger of his constituents too readily by disregarding their wishes in matters of foreign and domestic policy, for it to be thought that he would ever have sacrificed his convictions to insure his own success. It was against his inclinations that he had entered public life in the first place. If once in the battle he stayed there, it was from a sense of duty characteristic of his moral seriousness. He always preferred his leisure, and more than once he withdrew from public affairs only to reënter the arena at the first recall.

Little has been said of Gladstone's literary labors, which were enormous. He was a scholar of the old type, caring only for literature and

nothing for natural science. Many of his ideas were antiquated, for in literature he always remained the Tory, whatever he became in politics; that is to say, he believed in the principle of authority. To him the Bible was always the word of God and the law of Moses the law of Moses, while Homer was a real man describing real historic events. Still it is well to remember that Gladstone stood for an attitude toward the classics and the Scriptures which is associated with the high influence these works of antiquity have had for the race's civilization. There is something to be said for Gladstone's conservatism, perhaps even as against his radicalism in politics.

As to what Gladstone accomplished with his reforms in politics, it is too early to pass a complete judgment. The work which occupied him during the whole of the third period of his life is yet unfinished. His Irish land bills were partial measures only, and the principle of Home Rule needs still to be applied to show whether Gladstone was right or not in believing that therein lay the panacea for Irish evils. It is as a reformer in finance and as a defender of the liberties of all classes of the English people that he stands forth most strikingly in history. Free trade, equal taxation, popular education, manhood suffrage, these are the great causes with whose beneficial results he is identified to his greatest glory. It is in his foreign policy that he was weakest. Domestic questions interested him almost to the exclusion of foreign matters, excepting when a race or a nation was suffering from oppression or tyranny. The wrongdoings of the Turks in particular called forth his denunciation, and he was always preaching, as it were, a holy war against the Moslem. He contributed to the independence and union of Italy by his letter about the political crimes of the rulers of the Two Sicilies. Mention has been made of his efforts on behalf of Bulgaria and the Armenians. On the other hand, because he cared nothing for foreign policies as such, or for England's national prestige, he incurred the opprobrium of the people through what appeared to be his neglect of Gordon at Khartum, his submission to the Boers in South Africa, his willingness to submit to arbitration with the United States, and other matters in all of which he was content if he could avoid war and maintain an honorable peace. Personally Gladstone was a man full of charm and grace in his early years, and full of dignity and grandeur in his old age. The leading figure in Parliament for so many years, Justin McCarthy spoke well when he said that the House of Commons was no longer the same place without him.

Gladstone contributed articles on literary and political topics to the *Quarterly Review* and other magazines. Most of these were published under the title, *Gleanings from Past Years* (8 vols., 1879-90).

In 1839 Gladstone married Catherine, the elder daughter of Sir Stephen Richard Glynne of Hawarden Castle. She died on June 14, 1900. Four sons and four daughters were born, of whom the eldest, William Henry Gladstone, died in 1891, after sitting in Parliament from 1865 to 1885; Stephen Edward Gladstone is rector of Hawarden; the youngest son, Herbert John, became member of Parliament in 1890. The youngest

daughter, Helen, became principal of Newnham College, Cambridge.

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GLAGOLITSA, glā-gō-l'ětsā. One of the old Slavic alphabets, which contains characters arranged in the same order as in the Kirillitsa (q.v.). The shape as well as the numerical value of its letters is different from that of the Kirillitsa. The name is not derived from the fourth letter of the alphabet, *glagol*, but it is so called, since it is a collection of significant, telling signs (from OChurch Slav. *glagolati*, to speak). Kirillitsa is chronologically an earlier name, but there are good reasons to believe that it was the original name of what is now known as Glagolitsa. Jagie upholds the theory that Cyril invented Glagolitsa, and that his pupil, Saint Clemens, transformed it into Kirillitsa. Taylor (*Archiv für slavische Philologie*, vol. v., Leipzig, 1881) and Jagie derived it from the cursive Greek (not uncials) of the eighth and ninth centuries. Only the following can be set down as positive facts: Glagolitsa began to spread not later than Kirillitsa, among both the Southern and the Western Slavs. Then it went out of use completely in the South; in the West it was also superseded by the Roman alphabet in Bohemia; while in Croatia and Dalmatia it long maintained its existence with difficulty, and Pope Leo XIII. shortly before his death sanctioned the publication of ecclesiastical books in Glagolitsa characters. The Bulgarian ductus of the Glagolitsa is round, while the Croatian is more angular. The earliest Glagolitic manuscript extant belongs to the eleventh century. It is in the collection of Count Clotz, published at Vienna by Copitar in 1836 and known as *Glagolitsa Clotzianus*. On account of the difficulty of reading, the Glagolitic monuments are usually printed transliterated in the Cyrillic alphabet.

GLAIS-BIZOIN, glā'bē-zwān', ALEXANDRE (1800-77). A French legislator, born at Quintin (Côtes-du-Nord). After participating in the opposition to the Government of the Restoration, he was elected Deputy to the Chamber in 1831, and successively served in that capacity for seventeen years, when he became a member of the Moderate Republican Party in the Constituent Assembly. He subsequently served in the Corps Législatif from 1863 to 1870, in which year he was appointed a member of the Provisional Government. In May, 1871, he was arrested and imprisoned for a short time during the reign of the Commune. His *Dictature de cinq mois* (1872) discusses the national defense during the Franco-German War.

GLAISHER, glā'shēr, JAMES (1809-1903). An English scientist and aeronaut. His remarkable

ascent to 37,000 feet is recorded as the greatest effort of balloon ascension. He held many important positions, and published numerous books and papers on various topics connected with the mathematical sciences. His best known work is *Travels in the Air* (1880).

GLAIZE, glāz, AUGUSTE (1807-93). A French painter, born at Montpellier. He studied painting and lithography in Paris as the pupil of Eugène and Achille Devéria. After a few early works, such as "Dante Writing His 'Divine Comedy'" (1847), he turned his attention to the representation of abstract ideas in philosophy and ethics. His most important canvas in this manner is "The Drama of Human Folly" (1872). His work displays powerful color-effects and abundant invention. He further executed several frescoes in the churches of Saint-Sulpice (1859) and Saint-Jacques du Haut Pas (1868).

GLAIZE, PIERRE PAUL LÉON (1842-). A French painter, born in Paris. He was the son of Auguste Glaize (q.v.). Young Glaize studied under his father and Gérôme at the Ecole des Beaux-Arts. His works include: "The Treason of Delilah;" "Samson Taken by the Philistines;" "Æsop at the House of Xanthus" (which shows the influence of Gérôme); and "An Early Roman Conspiracy." The coloring in these works is strong and effective. He also painted scenes from the life of Saint Francis Xavier in the Church of Saint Merri, Paris.

GLAMMIS (glāmz) **CASTLE**. The imaginary scene of the murder of Duncan in Shakespeare's *Macbeth*. It is an ancient castle, the seat of the Earl of Strathmore, near Strathmore, Scotland, and is a fine example of the Scotch baronial castles.

GLAMORGANSHIRE (Welsh *Gwlad Morgannwg*). The southernmost county of Wales, bounded on the north by the county of Brecon, on the east by Monmouth, on the south and southwest by the Bristol Channel, and on the west by the county of Carmarthen (Map: Wales, C 5). The county is remarkable for its coalbeds and the great development of the iron industry. It also produces a considerable amount of grain, as well as large numbers of cattle, sheep, horses, and hogs. The chief towns are Cardiff, the capital, Merthyr-Tydvil, and Swansea. Population, in 1891, 687,200; in 1901, 860,000.

GLAMORGAN TREATY. A compact made with the Irish Roman Catholics by the Earl of Glamorgan on August 25, 1645. By it Charles I. was to receive military aid and Roman Catholicism was promised a more formal recognition by the Government.

GLANCE (Eng. equivalent of Ger. *Glanz*, glitter, used in the same sense). A name formerly applied to minerals which have a lustre similar to that of metals. The following are some of the more important of these minerals: *antimony glance*, which is the mineral *stibnite*, or antimony trisulphide; *bismuth glance*, which is *bismuthinite*, or bismuth trisulphide; *copper glance*, which is *chalcocite*, or cuprous sulphide; *glance blende*, which is *alabandite*, or manganese sulphide; *glance coal*, which is *anthracite*, or hard coal; *glance cobalt*, which is applied both to *cobaltite*, or cobalt sulpharsenide, and to *smaltite*, or cobalt diarsenide; *gold glance*, which is *sylvanite*, or gold and silver telluride; *lead glance*, which is

galena, or lead sulphide; and *silver glance*, which is *argentite*, or silver sulphide. The name *glance wood* has been applied to an exceedingly hard variety of wood that is found in the tropics, and is used for making tools.

GLANCE COAL. A popular term for any hard lustrous variety of coal, but usually applying to anthracite.

GLAND (Lat. *glans*, acorn). A term applied to a secreting organ. Glands are divided by anatomists into two great classes, viz. true secreting glands and ductless glands. The first class constitute special organs which are destined for the production of the chief secretions; as, for example, the lachrymal, mammary, and salivary glands, the liver, pancreas, kidneys, etc.; while the suprarenal capsules, the spleen, the thymus, and the thyroid belong to the second class.

SECRETING GLANDS. An ordinary secreting gland consists of an aggregation of follicles (small tubes or sacs), all of which open into a common duct, by which the glandular product is discharged. The follicles are lined with epithelial cells, placed upon a hyaline basement membrane, which in turn is surrounded by a network of capillaries. These furnish the blood from which is elaborated the secretion by the cell-substance or protoplasm of the epithelia, according to one theory. Some assert that the secretion is composed of transformed cell-substance. The secretion of a gland is either mucous (like saliva), serous (like tears), sebaceous (like the oil of the skin), or albuminous. The secretions of the testicle and ovary are notable for containing living cells, the spermatozooids and the ova, respectively. The simplest form of a gland is the inversion of the surface of a secreting membrane into follicles, which discharge their contents upon it by separate mouths. Of this we have examples in the gastric glands and follicles of Lieberkühn, described under DIGESTION, ORGANS OF. Secreting glands are divided into: (1) *Tubular*, consisting of cylindrical tubes, single or branching; and (2) *saccular*, composed of numerous sacs arranged about a short tube which joins other similar tubes. The sacs are called *acini*, and such glands are also called *racemose* (Lat. *racemus*, a bunch of grapes). To understand the structure of a complex gland like the liver or kidney, it must be followed from the simplest form in which it is known to occur through its various degrees of evolution. In this way the liver may be traced, from the lowest mollusca (where it exists as simple follicles, lodged in the walls of the stomach, and pouring their product into its cavity by separate orifices) up to man, in whom it is an organ of extreme intricacy; and similarly in the early fetal state of the higher animals, the liver and other secreting organs more or less resemble the persistent state of those parts in animals lower in the scale. In the same way the mammary gland, which is a structure of considerable complexity in the higher animals, presents a very simple arrangement in the lowest type of this class, the ornithorhynchus, being merely a cluster of cæcal follicles, each of which discharges its contents by its own orifice. Sometimes a gland has several ducts (as, for example, the lachrymal gland), but as a general rule the most important glands have only a single canal, formed by the union of the individual ducts, which conveys the product of the secreting action of the whole mass.

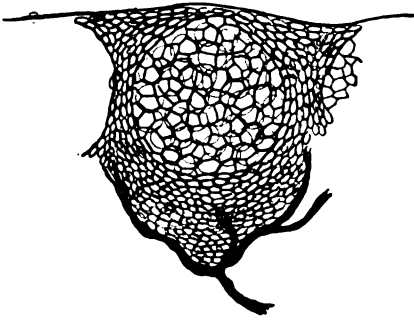
DUCTLESS GLANDS. Glands of the second class resemble those of the first class in external conformation, and in the possession of a solid parenchymatous tissue, but differ from them in the absence of a duct or opening for the removal of the products of secretion; and indeed, except in the case of the thymus, no material resembling a secreted product is yielded by any of them. In all of them, the tissue mainly consists of cells and nuclei, with a great abundance of blood-vessels. They furnish necessary material to the body, in some yet unascertained way. If they are removed by operation, or absent from birth, or atrophied during life, the result is a condition of disease. For example, removal or atrophy of the thyroid is followed by myxædema, a disease which is relieved by feeding thyroid gland to the patient.

The so-called *lymphatic glands* belong to a different class of structures, and will be described in the article under LYMPHATICS. They are not glands, but nutritive organs. See BARTHOLIN'S GLANDS; BRUNNER'S GLANDS; COWPER'S GLANDS; LIVER; PANCREAS; KIDNEY; THYROID GLAND; etc. Consult: Gray, *Anatomy, Descriptive and Surgical* (London, 1901); Morris, *Human Anatomy* (Philadelphia, 1902); Heitzmann, *Atlas der descriptiven Anatomie des Menschen* (Vienna and Leipzig, 1902); Freeborn, *Notes on Normal Histology* (New York, 1901); Stoehr, *Text-book of Histology, including the Microscopical Technique* (Philadelphia, 1901).

GLAND. In plants, a single cell or group of cells especially adapted to form and excrete some substances. Glandular cells are usually distinguished from others by the granular character of their protoplasm, especially when in the active state. Glands may be superficial or internal. *Superficial glands* may consist of a few cells or even a single cell, in which case they are often raised upon stalks and constitute the so-called glandular hairs, as upon the leaves of geraniums and primroses; they may have the form of disks upon short stalks, in which case the structure is known as a glandular scale; they may be groups of epidermal cells covering cushions of tissue, as in the so-called nectary (q.v.) in many flowers; they may be flush with the surface, pouring their secretion into gland-lined pits or depressions which may be narrow and deep or even branched canals, as in the nectar glands of some lily flowers. *Internal glands* in their simplest form consist of cells in which the secretion is formed and retained until released by the rupture or crushing of the tissues, as in the gland-cells of capers. Not uncommonly the gland-cells are destroyed by the plant itself, in which case the freed secretion occupies their place, as in the oil-glands of the orange and lemon rind; in other cases they line an internal spherical or tubular reservoir, into which the secretion is poured—as in the resin-tubes of pines (see figure).

Regarding the process of secretion nothing is definitely known. The secretion in most cases is formed by the protoplasm and within the cell-wall; in others it may be developed at the surface, the materials for it being secreted by the protoplasm. In superficial glands the secretion is sometimes pushed through the cell-wall as far as the cuticle, which it cannot penetrate, but which it lifts into a blister; e.g. the volatile oils secreted by many leaves.

Glands are named for the most prominent material which they secrete, as water, lime, nectar, oil, and resin glands.



GLAND OF ORANGE-RIND.

The gland-cells form a globular mass, secrete an essential oil, and finally become disorganized, leaving the oil free in the space they formerly occupied. The contents of the cells are not shown.

GLAND, COMPARATIVE ANATOMY OF. Neither a definition nor a classification of glands has yet been agreed on by comparative anatomists. Since the word itself offers no clew to its real meaning, we must attempt to define it from universally accepted examples. Among these may be mentioned salivary glands, lachrymal glands, sweat-glands, and poison-glands. All of these are organs which produce some particular substance from the blood with which they are supplied; furthermore, this substance is not cellular nor living, but is a mere chemical product. These facts give us a clew to our definition, and we may say that a gland is any cell or group of cells whose function is the production of a chemical substance, usually fluid, peculiar to itself. Such a definition will not include all those organs to which the name gland is given, but it will include all to which it ought to be applied. As an example of the incorrect use of the term, we may refer to 'reproductive' or 'genital' gland, as applied to the testis or ovary. These organs are not in any true sense glands, for they do not produce any chemical substance peculiar to themselves, but are simply the portions of the body where those cells are formed from which the next generation arises. So also the use of 'gland' in connection with the suprarenal capsule, the pituitary body, and the pineal body is incorrect and confusing.

Various classifications for glands have been proposed based on their structure, whether unicellular or multicellular, simple or branched, etc.; but it is perhaps as natural and certainly as convenient to arrange them according to their function. Thus we may class those which open on the surface of the body and are developed in the skin as tegumentary glands; those connected with the process of digestion as digestive glands; those connected with the blood system as vascular glands; those associated with the respiration as respiratory glands; and those connected with the reproductive organs as reproductive glands. The tegumentary glands may well be grouped according to their structure, as unicellular and multicellular glands, and the same classification is often applied to all glands.

Unicellular glands are everywhere abundant in invertebrates, but in vertebrates they are confined almost entirely to the lower forms. Multi-

cellular glands are to be regarded as aggregations of unicellular glands in one region. Soon the multicellular gland differentiates into a secretory and an efferent part, or duct. Multicellular glands with ducts are tubular or acinous. Globular glands also occur in the epidermis of Amphibia. The tubular glands may be simple, branched, or anastomosing. Tubular glands first occur in the Amphibia in a few cases, but they are very abundant as sweat-glands in mammals. Acinous glands first appear in birds as uropygial glands, where they occur on the rudimentary tail and produce the oil for oiling the feathers. Among mammals acinous glands are highly developed and are of two kinds: namely, sebaceous glands and milk-glands. The sebaceous glands open on the rim of the eyelid, and on other special parts of the body, in intimate relation with hairs. In addition to oiling the hair, these glands probably have a sexual function in mammals, since their secretion has a decided odor.

Milk-glands, characteristic of the mammalia, have probably a common ancestry with sebaceous glands, or they may even consist, indeed, of a group of highly specialized sebaceous glands. The glands of *Echidna* occur in the mammary pocket. Into this pocket the immature-hatched young are placed, and there they are nourished by a secreted substance which is not like the milk of other mammals. The glands are in connection with hair-follicles. Among marsupials there is a larger number of mammary pockets; but these pockets have lost their protective function, which latter function is assumed by the marsupium. In *Ornithodelphia* the nutritive function is subserved by the secretions of sweat-glands. The region of the integument, at which the glands open, is usually modified for the purpose of transmitting to the young the secretion of the glands. There are three types of these openings. The athelous type is found only in the lowest mammals; here the glands open diffusely on the surface without a true nipple. In the second type the glands open at the base of an elevated crater, and in the third the region of their opening is elevated to the apex of a cone. To the second type belong the glands of the carnivores and ungulates, and to the third class belong those of marsupials and primates. The number of these glands varies in different kinds of animals and with the number of young produced in a litter. In man two is the normal number, but in a number of cases supernumerary nipples have been recorded both for males and females. Such cases are atavistic and point back to the condition which existed in man's ancestor.

The liver and pancreas are recognized as the largest of the digestive glands, to which group also belong the salivary glands, gastric glands, and intestinal glands. The poison-glands of snakes, as modified salivary glands, also belong here. Of vascular glands the kidneys are decidedly the most important, while respiratory glands include the arytenoid and tracheal. Of reproductive glands we find a great variety among both invertebrates and vertebrates, such as the yolk and shell glands, and in mammals the Cowper's and prostate glands.

Any attempt to classify glands according to the substances they produce is unsatisfactory. Thus, if we attempt to separate secreting from excreting glands, we find that while the kidneys clearly belong in the latter class, the liver belongs to

both, though chiefly secretory, and sebaceous glands are also difficult to classify. Perhaps the most obscure organs of this class are the so-called 'ductless' glands, the spleen, thyroid, and thymus. They seem to produce some substance of great importance to the well-being of the body; but what it is, and how it affects the organism, are still involved in difficulties. However, as they are all closely associated with the blood system, they may well be called vascular glands.

GLANDERS (from *gland*, from Lat. *glans*, acorn). A virulent contagious disease due to the action of a specific microbe, the *Bacillus mallei*. The microbe was discovered in 1882 by Loeffler and Schütz. It is a short, rather stubby rod, with rounded ends. It stains irregularly, occurs singly, in pairs, or in long strings, and grows readily in the ordinary culture media. As a result of natural contagion, glanders is almost entirely confined to the horse, ass, and mule. Cattle enjoy an immunity from it, and sheep and pigs are highly resistant to natural contagion. Dogs, cats, and wild carnivora may become infected by eating the meat of glanderous horses. Glanders has been known since the time of the classic Latin and Greek writers as one of the most dreaded horse diseases. Its distribution is practically universal, though it is said not to occur in Australia.

Glanders appears under several forms with different symptoms. The acute and chronic forms of glanders are universally recognized. The acute form begins with a high fever. The coat is staring and there are frequent chills. The mucous surfaces are reddened or sometimes yellowish, purulent ulcers appearing on those of the nose. These ulcers rapidly increase in size and depth. Painful swellings occur on various parts of the body, especially in the neighborhood of the lymphatics. In many cases the joints of the legs are affected by acute inflammation. Death generally occurs in from eight to thirty days. Chronic glanders occurs in the skin-form known as farcy, and as true glanders affecting the lungs and other internal organs. In farcy the symptoms begin by the formation of nodules under the skin, known as farcy buttons. The surrounding tissues are broken down, and running ulcers are thus formed. After a variable period these ulcers heal. The disease breaks out again, however, in the same or other locations. The farcy buttons occur most frequently on the neck, shoulders, and inside the thighs.

During the progress of ordinary chronic glanders the lungs are affected by glanderous pneumonia. A lobular V-shaped pneumonia, occurring at the various foci of infection, is characteristic of glanders. Tubercles of sizes varying from that of a millet-seed to that of an egg are formed in the lungs, liver, spleen, and occasionally in the kidneys. The tissue of these tubercles breaks down, leaving cavities filled with pus, some of which, in long-standing cases, may ultimately heal.

The symptoms of chronic glanders which are most relied upon by practicing veterinarians for diagnostic purposes are nodular swelling of the submaxillary glands, a dry cough after exercise, farcy buttons on the skin, and a persistent purulent discharge from the nose.

The spread of the disease is due chiefly to the discharges from the nose and from farcy sores. The virus from these sources may contaminate harness, vehicles, fences, stables, water-supply,

etc., through which other animals are readily infected.

Nearly all the tonics and curative agents known to veterinary medicine have been used in the treatment of glanders, but without result. Medical treatment is of no avail. Spontaneous recovery takes place in rare instances. When the chief symptoms are those of farcy, apparent recovery takes place at intervals, followed by renewed outbreaks of the disease. The nasal symptoms may also cease, and later recur. In chronic cases the disease may persist for several years before death occurs.

Glandered animals should be shot and buried or burned. Such procedure is required by law in nearly all countries. Stables and all articles with which glandered horses have come in contact should be disinfected.

For the detection of cases of glanders the symptoms already mentioned are not always sufficient. In latent cases recourse is had to injections of mallein. This substance is prepared from the glanders bacillus and contains the glanders toxin, but not the living bacilli. An injection of this substance into healthy horses causes no reaction. In glanderous horses it produces an elevation of temperature, swelling of the submaxillary glands, and trembling, which subsides after a few hours. A rise in body temperature of 2°F. after a mallein injection is considered good evidence of the presence of glanders. Some investigators have obtained quite striking curative effects from the continued use of large doses of mallein. Injections of the colloidal silver preparation also cause an elevation of temperature in glanderous subjects, and are used to some extent as a diagnostic agent for glanders.

GLANDERS IN MAN, otherwise called **EQUINIA**. Man may acquire the disease by accidental inoculation from the horse, though several cases have been recorded in which glanders has been transmitted from one human being to another. The symptoms of acute glanders in man are: Weakness, chills, muscular and articular pains, the appearance of nodules with swelling and redness, rise of temperature, and suppuration. A single ulcer may cause great swelling of the whole hand and arm, with œdema, enlarged glands in armpits, and subsequent ulcers and pustules upon the swollen surface. A discharge from the nasal cavities appears, watery and viscid at first, afterwards purulent and very offensive. The nose becomes swollen and painful, and perforations of the cartilage occur. The mouth becomes dry, dark red, and thickly coated; constipation is followed by diarrhœa; intense nervousness or delirium may follow; albumin appears in the urine. Emaciation and prostration are followed by death in the fourth week, in fatal cases. Besides the acute form just described, there is also a chronic form of glanders in man, but this occurs very rarely. Consult: Bass, "Die Rotzkrankheit der Pferde," in *Deutsche Zeitschrift für Thiermedizin* (Leipzig, 1893); Nocard and Leclainche, *Les maladies microbiennes des animaux* (Paris, 1898); Grange, "Glanders and Farcy," in *Michigan Experiment Station Bulletin No. 78* (Agricultural College, Mich., 1891); Williams, "Glanders," in *Montana Experiment Station Bulletin No. 4* (Bozeman, Mont., 1894).

GLANDINA (Neo-Lat., from Lat. *glans*, acorn). A genus of large pulmonate mollusks, or land-shells, of the shell-bearing slug

family Testacellidæ. It includes about 125 species, whose shells are somewhat fusiform in shape, smooth, polished, and beautifully colored and marked. They creep about among the herbage and on bushes, and are voracious feeders upon other smaller snails and all sorts of animal matter. Most of them belong to the American tropics, but one, at least, is European. Several species enter the southern border of the United States, of which the best known is the rose-tinted extremely variable *Glandina truncata*, which is illustrated on the Colored Plate of NORTH AMERICAN SNAILS.

GLANDS, DISEASES OF THE. The lymphatic glands are subject to enlargement from acute inflammation and abscess, usually in consequence of irritation of the part from which their lymphatics spring, as in the case of scarlet fever and diphtheria (qq.v.), in which the glands of the throat are affected; or in the case of gonorrhœa (q.v.), in which the glands of the groins are affected; in bubonic plague, in which the glands of the groins, armpits, or neck, etc., may be affected. The treatment of such abscesses is within the scope of ordinary surgery. A much more troublesome affection of the glands is the slow, comparatively painless, at first dense, solid swelling which they undergo in scrofula (q.v.), which tends very slowly, if at all, to suppuration, and sometimes remains for years. In syphilis (q.v.) and cancer there are also enlargements of the lymphatic glands. Scrofulous or tubercular diseases of the mesenteric glands in children constitute *tubercles mesenterica*. (See MESENTERY.) The larger glands, as the liver, kidney, pancreas, spleen, thyroid, thymus, testicle, and even the pituitary gland, have all their special diseases, which are noticed under the names of these organs.

GLANEUSES, gl'ânēz', LES (Fr., The Gleaners). A celebrated painting by François Millet (1857), representing a field in which three women are picking up the forgotten stalks, while the laborers are seen with loaded wagons in the background. The picture is remarkable for its effects of light, and is considered one of Millet's best works.

GLANVILL. The putative author of the first classical text-book of the English common law. This work, *A Treatise on the Laws and Customs of England* (*Tractatus de Legibus et Consuetudinibus Angliæ*), appears from internal evidence to have been composed toward the close of the twelfth century, and in the last years of the reign of Henry II. The Glanvill whose name it bears is doubtless the celebrated Ranulph de Glanvill, Chief Justiciar and Prime Minister of Henry, one of the conspicuous figures of that stormy period of English history. He came of a Suffolk family of position, was Sheriff of Yorkshire from 1163 to 1170, and in 1174, when Sheriff of Lancashire, led the forces of the King against the invading Scots, and won a great victory. Thereafter his place was at the right hand of the King as trusted adviser, ambassador, prime minister, and justiciar. He died at Acre in 1200, to which place he had gone with Richard I. on his crusade to the Holy Land.

But there is no trustworthy evidence that Ranulph de Glanvill wrote the law book attributed to him. It is more likely to have been the work of some learned clerk at his court, perhaps of his

secretary and kinsman, Hubert Walter, and that the title of the work is a dedication rather than an attribution. But there can be no doubt that it represents the law of Glanvill's time, and is a correct picture of the legal system which he was engaged in shaping. Though the writer must have had some knowledge of the canon law, his work is English both in matter and arrangement. That is to say, it is not 'institutional' and scientific in form, but empirical and practical. It sets forth the procedure of the King's Court, the *Curia Regis*, the various pleas which it will entertain, the several classes of wrongs which it will remedy, and the plea appropriate to each, and so considers the substantive law, both civil and criminal, after the usual common-law method, from the standpoint of procedure. It immediately took high rank as a legal authority, and retained its unquestioned supremacy until superseded, sixty or seventy years later, by Bracton's great work. In the meantime many editions, as we should call them, by various annotators, appeared, and many of these manuscripts are still in existence. A Scotch version, known as the *Regiam Majestatem*, long passed as an original treatise.

Glanvill was first printed in the year 1554 at the instance of Sir W. Stanford, a judge of the Court of Common Pleas. It was early translated into French and an English version by Beames appeared in 1812. A new edition of Beames's translation has recently appeared under the careful editorship of Prof. Joseph H. Beale, Jr. (Washington, 1900).

GLANVILL, JOSEPH (1636-80). An English divine, born at Plymouth. He graduated at Exeter College, Oxford, in 1655, took the degree of M.A. at Lincoln College in 1658, and became chaplain to Francis Rous, provost of Eton. After the Restoration he conformed, and in 1660 became rector of a little church at Wimbish, Essex, by appointment of his brother, a prominent London merchant. He became interested in the teachings of Henry More and the Cambridge Platonists, and was one of the early fellows of the Royal Society. At Wimbish he wrote his first and best known work, *The Vanity of Dogmatizing* (1661), an attack on the scholasticism of the Oxford School. It is chiefly interesting because it anticipates Hume's theory of causation, and because of a curious anticipation of the electric telegraph, in which he says: "To enter at the distance of the Indies by sympathetick contrivances may be as natural to future times as to us is a literary correspondence." It also contains the story of the 'Scholar Gypsy' from which Matthew Arnold obtained the basis for his notable poem. He was appointed rector of the Abbey Church at Bath in 1666, and chaplain in ordinary to Charles II. in 1672. During the 'Popish Plot' excitement he wrote a spirited attack on the non-conformist sects, *The Zealous and Impartial Protestant* (published after his death in 1681). Among his voluminous works, written in a rather rhetorical style, besides those mentioned are: *Lux Orientalis* (1662), a defense of More's doctrine of the pre-existence of souls; *Scæpsis Scientifica* (1665; reprinted 1885), a revision of his first work with additions; *Philosophical Considerations, Touching Witches and Witchcraft* (1666); *Plus Ultra, or the Progress and Advancement of Knowledge Since the Days of Aristotle* (1668); *The Ways of Happiness* (1670); *An Earnest Invitation to the Lord's*

Supper (1673); *Essays on Several Important Subjects* (1676), containing his remarkable "Anti-Fanatical Religion and Free Philosophy," in continuation of Bacon's *New Atlantis: An Essay Concerning Preaching* (1678).

GLANVILLE, BARTHOLOMEW DE. See BARTHOLOMÆUS ANGLICUS.

GLAPTHORNE, HENRY. An English dramatist of whose life nothing is known except that he was a friend of Cotton and Lovelace, and wrote most between the years 1639 and 1643. His works consist of: *Albertus Wallenstein*; *Argalus and Parthenia* (1639), a dramatization in verse of a part of the *Arcadia*; *The Hollander* (1640); *Wit in a Constable* (1640); and *The Ladies' Privilege* (1640). Other plays have been credited to him, but the authorship is most uncertain. He wrote a volume of *Poems* (1639); and a poem called *Whitehall* (1643). His works may be characterized as indifferent and feeble.

GLAREANUS, glä'ra-nōs, HENRICUS (1488-1563). A Swiss humanist and musical theorist, whose name was Heinrich Loriti. He was born at Mollis, Canton of Glarus (whence his name). He studied music under Cochläus at Cologne, where he also gave considerable attention to philosophy and theology. At the age of twenty-four he became poet laureate to Emperor Maximilian I. He taught mathematics at Basel from 1515 to 1517, when his friend Erasmus is said to have secured for him an appointment to the chair of philosophy at Paris. At first a defender of Reuchlin, and a follower of the Reformation, he is believed subsequently to have changed his views, and to have removed to Basel, accepting a professorship at the university in that city about 1529, whence he afterwards removed to Freiburg. Biographical details concerning him are somewhat meagre and unreliable; more is known of his work. One of his principal publications is entitled *Isagoge in Musicen Henrici Glareani*, etc. (1516), the first work published by him, and treating of solmization, the intervals, tones, and modes. His *Dodekachordon* (1547) is still of great value to the historian and student of music, inasmuch as here, for the first time, the theory is enunciated that there should be twelve, instead of eight, church modes, corresponding to those of ancient Greece. The work is divided into three parts and is furnished with numerous examples from the works of Ockenheim, Josquin de Près, and other famous composers of the fifteenth and sixteenth centuries.

GLARUS, glä'rōs. A canton of Switzerland, bounded by the Canton of Saint Gall on the north and east, Grisons on the south, and Uri and Schwyz on the west (Map: Switzerland, D 1). Area, 267 square miles. The centre is taken up by a valley open on the north and inclosed on the east, south, and west by snow-capped mountains, most of them exceeding 10,000 feet in altitude. The chief river is the Linth, flowing into the Wallensee. Agriculture is of secondary importance, domestic products not sufficing to meet the home demand. The chief manufactured products are cotton, woolen, and silk goods, and beer. The canton is well provided with transportation facilities, and carries on a considerable trade in textiles.

The form of government is thoroughly demo-

cratic. The people exercise their legislative power directly, assembling for that purpose once a year in the Landsgemeinde. The executive power is vested in a council of seven members elected by the Landsgemeinde for three years. The rural communities are administered by communal councils. The population of Glarus was 33,825 in 1888, and 32,349 in 1900. The inhabitants are mostly Protestant and speak German. Capital, Glarus (q.v.).

GLARUS. The capital of the Swiss canton of the same name, situated on the Linth, 43 miles by rail from Zurich (Map: Switzerland, D 1). The chief buildings are the Gothic church, used by Roman Catholics and Protestants, and the Government buildings, containing a natural museum and an art collection. The town is lighted by gas and electricity, and has water-works. There are cotton-printing mills, bleacheries, cigar-factories, and breweries. The commerce is of considerable importance. Population, including the suburbs, in 1900, 4877, mostly Protestants.

GLAS, JOHN (1695-1773). Founder of the Glassites or Sandemanians. He was born at Auchtermuchty, Fifeshire, Scotland, September 21, 1695. He studied at Saint Andrews and Edinburgh, entered the ministry, and became a popular preacher. In his *Testimony of the King of Martyrs* (1727) he maintained that all national establishments of religion and all interference of the civil authority in religious affairs are inconsistent with the true nature of the Church of Christ, and was thus probably the first to assert the voluntary principle in Scotland. For advocating such views he was first suspended, and later deposed from the ministry (1730). He then formed an independent congregation in Dundee, and in 1733 removed to Perth, where he built his first church. He was here joined by Robert Sandeman, who married his daughter, and became the better-known leader of his followers in England and America. He died at Perth, November 2, 1773. Notwithstanding some intellectual eccentricities, Glas was a man of strong character and sound scholarship. His works were published at Dundee in 1782-83. The thirteenth edition of his *Christian Songs* appeared at Perth in 1847. See SANDEMAN, ROBERT; SANDEMANIANS.

GLASER, glä'zër, ADOLF (1829-). A German author, born at Wiesbaden. For more than twenty-two years (1856-78) he continuously conducted *Westermann's Illustrierte Monatshefte* and he again became associated with that publication in 1882. His first success was the novel *Schlitzwang* (2d ed. 1819), which was followed by a long series of historical novels, such as *Wulphilde* (1880) and *Savonarola* (1883). His principal dramas are also chiefly historic; they include *Galileo Galilei* (1861) and *Johanna von Flandern*. He is favorably known as a translator from the Dutch. His collected works were published in twelve volumes in 1891.

GLASER, EDUARD (1855-). An Austrian explorer, born at Deutsch-Rust, Bohemia. He studied physics, geology, and astronomy at Vienna and Prague, and afterwards devoted himself to the study of Oriental languages, visiting Egypt and Tunis for that purpose. In 1882 he observed a total eclipse of the sun at Sohag, Upper Egypt, and subsequently made a trip to

Southern Arabia. In 1885 and thereafter he again made several tours through Arabia, and collected nearly 2000 manuscripts and numerous archaeological specimens. Many of these acquisitions, which are relics chiefly of the city of Mārib, the capital of the ancient Sabæan kingdom, are in the Imperial Library, Vienna. Glaser's researches on the topography of Arabia, and on the various dialects of the southern portion of the peninsula, are also highly important. Besides numerous contributions to scientific periodicals, his publications include the works entitled: *Mitteilungen über einige aus meiner Sammlung stammende sabäische Inschriften* (1886); *Skizze der Geschichte und Geographie Arabiens von den ältesten Zeiten bis zum Propheten Muhammad* (1889 et seq.); and *Die Abessinier in Arabien und Afrika* (1895).

GLÄSER, glä'zër, FRANZ (1798-1861). An Austrian composer. He was born at Obergeorgenthal, Bohemia, and after singing for some time in the choir of the Court chapel at Dresden, he entered the conservatory of Prague. He was conductor at the Josephstädter Theatre, Vienna, from 1817 until 1830, when he was called in the same capacity to the Königstädtisches Theatre, Berlin, where his best opera, *Des Adlers Horst*, was produced in 1832. This opera was subsequently extensively performed throughout Germany, and until about 1870 enjoyed considerable popularity. In 1842 Gläser was appointed royal orchestra leader at Copenhagen, where he remained until his death. Among the thirteen operas composed by him, the above-mentioned production and *Die Hochzeit am Comersee* were the most successful.

GLASER, glä'zër, JULIUS ANTON (originally **JOSUA**) (1831-85). An Austrian jurist and statesman. He was born at Postelberg, Bohemia, of Jewish extraction, and was educated at Vienna and Zurich. In 1856 he was appointed professor in the University of Vienna. In 1871 he was elected to the Diet of Lower Austria, and from 1873 to 1879 he was a member of the Austrian Reichsrat. During the period of 1871-79 he was Minister of Justice in the Auersperg Cabinet, and subsequently was procurator-general at the Court of Cassation, Vienna. He was one of the foremost jurists of his day, and aided greatly in the reformation of criminal jurisprudence in Austria. His principal publications are: *Die Fragstellung im Schururgerichtsverfahren* (1863); *Zur Juryfrage* (1864; republished with the preceding work in 1879, under the title *Schururgerichtliche Erörterungen*); *Anklage, Wahrspruch und Rechtsmittel im englischen Schururgerichtsverfahren* (1866); *Gesammelte kleinere Schriften über Strafrecht, Civil- und Strafprozess* (2d ed. 1883); *Sammlung strafrechtlicher Entscheidungen des k. k. Obersten Gerichtshofs* (3 vols., 1872).

GLASGOW, gläs'kò. The industrial metropolis and the largest city of Scotland; after London, the largest city in the United Kingdom (Map: Scotland, D 4). It is situated on the Clyde, in the lower ward of Lanarkshire, and occupies chiefly the north side of the river, but has large and populous suburbs on the south side. The river is crossed by several bridges. Two of granite and one of iron are much admired for their light and graceful architecture. Two

are suspension bridges, and two are the viaducts of the Union and the Caledonian railways. Below the bridges, ferry-boats ply at all hours.

Glasgow is built for the most part on level ground, but in the north and northwest districts there are considerable elevations. Owing to the great number of factories and mills of all kinds, the city has a somewhat dingy and smoky aspect; in other respects it has many attractions. The houses facing the river stand well back, leaving spacious thoroughfares on each side which afford full and noble views of the bridges, of several handsome street ranges and public buildings, and of the harbor with its funnels and forests of masts. Most of the leading streets run from east to west, parallel with the river, and almost all the streets, except in the oldest parts of the city, are laid in straight lines. The houses are generally lofty, and built of freestone, the floors of each tenement being usually occupied by separate families, entering by a common stair. In the fashionable quarters elegant residences prevail. The city may be divided into the eastern and western sections, separated by Buchanan Street, the former containing all that there is of antiquarian interest, and many of the modern public buildings; the latter, the more modern and fashionable quarter. The principal business streets are Argyll, running parallel to the river; Buchanan, running at right angles; and Sauchiehall, the main thoroughfare to the west end residential section. George Square, the centre of the city, is adorned with a lofty column surmounted by a statue of Sir Walter Scott, equestrian statues of Queen Victoria and the Prince Consort, and statues of Sir John Moore, James Watt, Sir Robert Peel, William Pitt, and others. About this square are clustered some of the most notable buildings in the city, such as the municipal buildings, Merchants' House, Bank of Scotland, and the General Post Office. Among other public buildings are the Royal Exchange in Queen Street, in the Corinthian style, in front of which stands a colossal equestrian statue of the Duke of Wellington; the magnificent new buildings of the university, erected at a cost of over \$2,000,000; the corporation galleries, containing an extensive picture collection; and the Institute of Fine Arts, devoted to periodical exhibitions of modern works of art. The buildings of antiquity are situated in the Irongate and High Street. The cathedral, begun in 1238 and completed about the middle of the fifteenth century, was designed in the form of a cross, but the transepts were never completed. It is Early English in style, and is particularly noted for its beautifully proportioned and elaborately decorated crypt. In the Necropolis above the cathedral are numerous tasteful monuments, the most conspicuous being the column erected in memory of John Knox. It is the burial-place of the dramatist Sheridan Knowles.

Glasgow owes its industrial and commercial importance to its advantageous situation in the midst of a district abounding in coal and iron. Much of its prosperity is due also to its position at the mouth of the Clyde River and the possession of a splendid harbor. Over \$100,000,000 has been expended in the widening and deepening of the river, which is now navigable by vessels drawing 23 feet of water. The merchant marine of Glasgow in 1891 comprised

1576 vessels, of which 1013 were steamships, with a total capacity of 1,309,816 tons; in 1900 there were 1668 vessels (1172 steamers), with a tonnage of 1,630,170. More than 11,000 ships, with over 7,000,000 tons of merchandise, entered and cleared during that year. The total value of imports during that year exceeded \$70,000,000, the average annual value during five years preceding having been \$63,000,000; value of exports over \$92,000,000, showing an increase from 1896 to 1900 of over \$4,600,000. The chief articles of export are woolen, cotton, and linen goods, machinery, mill-work and metal manufactures, coal, paper, chemicals, and spirituous liquors. The imports include largely raw products, such as wheat, corn, flour, sugar, wool, metal ores, timber, tobacco, and petroleum. Among Glasgow's industries, ship-building is one of the most conspicuous, the city being the chief centre of that industry in the world; the building of all kinds of machinery is next in importance, followed by cotton spinning and weaving, the latter industry employing some 20,000 people. Calico-printing, dyeing, and beer-brewing should be mentioned, as well as the famous Saint Rollox Chemical Works, one of the largest of its kind in the world, having a chimney-stack 460 feet high, a conspicuous landmark of the city.

The government of the city is administered by a lord provost, ten bailies, and forty-eight councilors, to whom are added the dean of guild from the Merchants', and the deacon-convenor from the Trades' House. See paragraph on *Local Government* under GREAT BRITAIN.

Glasgow has led in the work of municipal reform in Great Britain. Its various improvements and great undertakings have been carried out by the Municipal Council, which, under an act of Parliament, constituted itself in each case as a 'trust,' such as the Improvement Trust, the Police Trust, the Market Trust, the Navigation Trust, etc. For purposes of practical work, the various trusts, i.e. the council in its several capacities, elect sub-committees, which have immediate supervision of the respective departments of city administration. Thus the Sanitary Department, or Board of Health, is under the supervision of a council committee of eighteen, with sub-committees on cleansing and hospitals. It is administered by a chief inspector, assisted by some hundred and fifty inspectors, the work of each being highly specialized. The thorough organization of the Board of Health and the numerous other improvements of the city were necessitated by the extreme density of the population, and the consequent high rate of mortality among the working people. In 1865, the year marking the beginnings of the various public undertakings, the average density was nearly 600 to the acre, exceeding 1000 in certain districts. The average mortality in 1864 was 32.8 per thousand, and as high as 38.64 for a series of preceding years. The great work of the Improvement Trust in cutting wide streets as well as in laying out new ones, in demolishing old buildings and creating vacant space, and in a good many other ways helping to disperse the population over a wider area, resulted in reducing the average density to 92 in 1891. Still, at the present day, a vast number of families occupy single-room dwellings. The death-rate has been steadily falling, as seen from the following figures: In 1864 it

was 32.8; in 1872, 28.7; in 1886, 24.3; in 1896, 20.4; in 1898, 21.2.

In addition to its work of prevention of disease, the Sanitary Department pays due attention to combating prevailing disease. Its two great municipal hospitals are not only models in appointment, but are built in a very attractive manner. Special buildings are provided for infectious diseases. The sanitary wash-houses are used for disinfecting the belongings of families whose members are afflicted with contagious diseases, the families themselves being entertained at the cost of the city in its 'house of reception' while their homes go through the process of disinfection and whitewashing. The Cleansing Department probably contributes as much to the health of Glasgow as its Sanitary Department. In addition to the usual sweeping and sprinkling of public streets, this department attends to the cleansing of private court-yards and passageways, the owners being assessed a slight tax to cover the expense. The street-sweeping is done by machines at night. The litter swept up by men and boys during the day is deposited in covered iron bins, located under the surface of the streets at short intervals. There are three principal 'dispatch stations,' together with a number of minor ones, at which the city garbage undergoes a treatment which converts the greater part of it into manure. The city owns a number of farms for the utilization of that part of the refuse which cannot be marketed. To avoid contamination of the waters of the Clyde, the city's sewage is treated chemically in a special sewage plant, where it is made to precipitate all its solid ingredients, which are then made into 'cakes' by powerful presses, and passed automatically into freight-cars standing on the tracks below. Most of the cakes are utilized at the city's farm for raising fodder for the horses employed in the Cleansing and Street Railway departments. The water remaining after the precipitation of the solid ingredients is filtered, and passed entirely pure into the Clyde. All of these improvements, though originally involving a considerable outlay of capital, have more than paid for themselves.

The Glasgow police consists mostly of Highlanders, nearly 1400 in number, who are universally praised for their intelligence and efficiency. The police courts constitute a part of the police department. Justice is administered by the Lord Provost and the bailies. Half of the expense of the department is met by the General Government, the net cost of the police service to the city being only \$250,000.

The city possesses considerable and profitable real estate. There are, at present, some two dozen municipal tenements, which, though superior to the private houses of the same class, are built largely in undesirable localities, and thus utilize land which could not be disposed of otherwise. The city owns also a great number of old, insanitary tenements.

The seven municipal lodging-houses, six for men and one for women, are models in their line, and a boon to the poor. Although the charge is only seven to nine cents per night, they yield a revenue above all expenses, including interest. In 1896 the municipal family home was opened to accommodate families of widows or widowers

who are obliged to part with their children during the day. It contains all the necessary accommodations, including playrooms, playgrounds, and a nursery. There are nurses to take care of the children while their parents are at work. The charges are: For mother with one child, 76 cents per week; mother with two children, 92 cents. Board: Breakfast, five cents; dinner, eight cents; tea, six cents. The public baths comprise five large establishments containing swimming-pools, and accommodating on the average 1500 people per day. The public wash-houses are fitted out with steam boiling apparatus, centrifugal machine driers, hot-air apartments, steam-operated roller-mangles, etc. The charge for their use is four cents per hour.

The public lighting is done by the city. After having taken over the gas plant, the city went on improving it, at the same time reducing the cost of gas to consumers. In the twenty odd years from 1869 to 1891 the population increased from 25 to 30 per cent., and the consumption of gas increased 170 per cent. From \$1.14 per 1000 feet in 1869, the price has gradually been reduced to 60 cents, without diminishing the net profits. In 1893 the city opened a large electric plant which has proved a great success, and lights not only the streets and public buildings, but also all private courts and stairways.

The water-supply is under the management of the City Council, known for that purpose as the Board of Water Commissioners. In 1860 a new supply of water was introduced from Loch Katrine by means of a large reservoir covering an area of 86¼ acres, at a distance of seven miles from the city and 300 feet above its general level. The high pressure thus attained is utilized through a 'Hydraulic Power Works,' and furnishes motive power for elevators, light machinery, etc. With a steadily diminishing water-rate the city has been able to meet not only all the expenses including interest, but also to accumulate a sinking fund.

In 1894 the city took over the street-car system; by the terms of the original contract it did not have to pay a cent for the plant, but received from the company a total sum of \$225,000 in rental money, and had exacted another sum known as the renewal fund to keep the system in repair. Since then a new set of commodious cars has been put in, certain extensions have been made, and the horse-car service has been replaced by a modern electric traction system, all completed by the summer of 1901. After carrying out all of the improvements and charging the low rate of one cent for short rides and two cents for long ones, and after having reduced the hours of its employees from fourteen (under the rule of the company) to ten, and advanced their wages, the city has managed not only to pay all expenses, including depreciation and interest on capital, but it lays aside annually about \$300,000 in the sinking and general reserve funds.

Glasgow possesses a system of municipal markets, used, however, for wholesale transactions only. All slaughtering is done in the municipal abattoirs, yielding an income to the city of some \$100,000 per annum. Under the name of the Clyde Navigation Trust, the city operates the harbor ferries, and holds a monopoly of all

harbor services, reaping an annual revenue of about \$2,000,000. Glasgow has no municipal library, but a private library known as the Mitchell Library receives a grant from the city corporation, and serves the purpose of a public library. It contains about 120,000 volumes.

The schools are managed very successfully by the Glasgow School Board, as may be seen from the increasing attendance in public schools and the diminishing numbers in private ones. Thus in 1880 the enrollment in public schools was 37,263; in Roman Catholic, 13,864; in all others, 19,080. In 1890 the respective figures were 65,000, 15,000, and 6000, in round numbers. A system of fees prevails in the schools which divides them into three distinct classes, each aiming to furnish the same kind of education, but serving to separate the children of the rich from those of the poor. The fees, however, are insufficient to cover all the expenses. There are a number of technical schools, governed by a board of trustees, on which the Glasgow University is also represented. In addition to the university (see GLASGOW UNIVERSITY), which since 1902 has benefited by Mr. Carnegie's munificent gift to Scotch universities of \$10,000,000, there are the Glasgow and West of Scotland Technical College, Saint Mungo's College, Anderson's College, and Saint Margaret's College for women. The secondary schools include the High School, Glasgow, and Kelvinside academies, and the Hutcheson Trust schools. There are numerous hospitals and dispensaries, and three large, excellently appointed general infirmaries. Glasgow has a number of theatres and large concert halls. The Botanic Gardens near the Western Infirmary, with their large conservatories and fine collections of exotic and other plants, form a favorite resort for the citizens. The other large parks are the Glasgow Green on the Clyde, the new West End Park (Kelvin Grove), containing beautiful hills, and Queen's Park on the south side. Population, in 1891, 565,000; in 1901 (of royal and municipal burgh), 760,423. Glasgow is the seat of a United States consul.

Glasgow traces its beginnings in tradition to the little wooden church which Saint Kentigern, apostle to the Scots, built on the banks of the Molendivar about A.D. 560. Nothing is known of the town for more than five hundred years, till David, Prince of Cumbria, the future King David I., in 1116, re-established the See of Glasgow and rebuilt its church. Between 1175 and 1178 Glasgow was made a burgh, subject to its bishop, whose bailie and provosts administered its affairs. In 1450 it was made a regality; in 1611 it gained by charter the right of electing its magistrates, and in 1636 became a free royal burgh. Its university, modeled on that of Bologna, was founded by a Papal bull in 1451. In the seventeenth century the town was a stronghold of Whiggism and the Reformed religion. The great commercial growth of Glasgow dates from the union with England in 1707. Enjoying equal freedom of trade with English ports, it quickly obtained a large share of the American trade, for which its position on the west coast fitted it especially. Glasgow became the chief emporium of the tobacco trade, and its Virginian merchants formed a local aristocracy, remarkable for wealth and distinction. This trade was at length paralyzed by the American war; but

sugar cultivation in the West Indies and the introduction of the cotton manufacture opened up new paths to wealth.

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GLASGOW. A city and the county-seat of Barren County, Ky., 100 miles south of Louisville; on a branch road connecting with the Louisville and Nashville Railroad (Map: Kentucky, F 3). It has the Liberty Female College. The city is in the oil region of the State, and its industrial establishments include flour-mills, lumber-mills, handle-factories, a woolen-mill, etc. Population, in 1890, 2051; in 1900, 2019.

GLASGOW UNIVERSITY. One of the great seats of learning in Scotland. It was founded in 1451 by Bishop Turnbull, its foundation being ratified by a Papal bull of Nicholas V. In 1460 James, first Lord Hamilton, bequeathed a tenement and four acres of ground to the Regents of the 'Pædagogium,' or college of arts, and the university was further endowed by Queen Mary, as well as by her son, James VI. of Scotland, better known as James I. of England, who issued a new charter to the institution. The chief prosperity of the university, however, dates from the middle of the nineteenth century. In 1864 the university buildings and adjacent lands were sold, and splendid new buildings were erected on a site overlooking the Kelvin River, at a cost of about £470,000. These were opened in 1870, and have been extensively added to since 1892. By acts of Parliament, in 1858 and 1889, the university has been entirely reorganized, and is now a corporation consisting of a chancellor, rector, dean of faculties, principal, professors, and students. The university court consists of the rector, the principal, the Lord Provost of Glasgow, and various assessors, representing both city and university. This body administers the property of the institution, appoints and regulates professors, and acts as court of appeal from the senate, which consists of the principal and professors, and regulates teaching and discipline. The general council, consisting of various ex-officio members and all masters and doctors, meets twice a year to revise the business of the university. It elects the chancellor, four assessors to the court, and, with the general council of Aberdeen University, returns one member to Parliament. There is also a students' representative council. The chancellor holds office for life; the rector, generally some man distinguished in politics or letters, is chosen triennially by the students. The duties of the latter are wholly

honorary. The students retain many of the earlier customs and rights of mediæval universities, of which the election of the rector is one. They are still divided into four 'nations'—Glotiana (Lanarkshire), Transforthana (Scotland north of the Forth), Rothseiana (Bute, Renfrew, and Ayr), and Loudoniana (all others).

The university grants degrees in arts, science, medicine and surgery, divinity, and law. It is possessed of a library of 210,000 volumes, an observatory, and a botanical garden, besides many special collections of books, apparatus, and the great Hunterian collection of coins, medals, and anatomical preparations. One of the important features of the university is the number of scholarships, exhibitions, and fellowships in its gift, among which the Snell exhibitions are the oldest and richest.

The University of Glasgow is rich in the number of distinguished graduates and teachers. Among them may be mentioned Bishop William Elphinstone, John Major, John Spottiswoode, Andrew Melville, James Melville, Robert Boyd of Trochrigg, John Cameron, Zachary Boyd, Robert Baillie, James Dalrymple, first Viscount Stair, Gilbert Burnet (Bishop of Salisbury), John Douglas (Bishop of Salisbury), Dr. Robert Simson, Francis Hutcheson, Dr. William Hunter, Dr. James Moor, Adam Smith, Dr. Thomas Reid, Dr. William Cullen, Dr. Joseph Black, Dr. Matthew Baillie, Prof. John Miller, Thomas Thomson, Francis Jeffrey, J. G. Lockhart, Sir William Hamilton, Archbishop Tait, Prof. R. C. Jebb, Lord Kelvin, and Sir Joseph Lister. The four hundred and fiftieth anniversary of the foundation of Glasgow University was celebrated with much pomp in 1901; and in the various publications of that celebration is to be found much valuable information regarding the institution. Consult also: Stewart, *The University of Glasgow* (Glasgow, 1891); and the *Glasgow University Calendar*.

GLASS (from AS. *glas*, Icel., OHG. *glas*, Ger. *Glas*; connected with Icel. *gler*, AS. *glær*, amber, and ultimately with Eng. *glare*). The use of glass came to the West from the East, and for that reason there is a diversity of names among the Indo-European nations. In Greek the usual word is *βᾶλος*, of which the etymology is uncertain. In Latin the word is *vitrum*, which also means *wood*, used for its blue dye, and perhaps points to the fact that the earliest glass known to the Romans was in the form of blue beads. Among the northern peoples the original name of the amber (OHG. *glas*) was transferred to the new material, and has given rise to the English *glass*. The French (*verre*) and most of the other Romance languages have kept the Latin name.

The manufacture of glass was known to the Egyptians at a very early date. Tombs of the fourth and fifth dynasties (c.4000 B.C.) show glass-blowers at work, and glazed pottery in the form of beads occurs in prehistoric times, though true glass first appears later in the form of opaque 'paste,' and finally as transparent glass. The oldest example of dark-blue glass is a pendant found at Naqada, which seems to date from the seventh dynasty, though no other specimens of this manufacture are known before the eighteenth. The fullest information as to the processes and materials used by the Egyptians is furnished by the discovery of the glass-works at

Tell el-Amarna, belonging to the eighteenth dynasty. Here were found fritting-pans in which the first melting of the substances took place, and also many imperfectly fused frits. The ingredients used were silica, lime, alkalies, and copper carbonate, but the exact proportions needed to secure a given color do not seem to have been known, and the exact tint produced must have been largely a matter of chance. They did know, however, that river sand, from the presence of iron, gave a green tinge, and to avoid this used crushed quartz pebbles. After the mixture had been fused until the colors began to appear, it was formed into cakes of paste, and these were again heated until the proper tint was reached. These cakes were fused in crucibles, and allowed to cool in them, so that the impurities rose to the surface or settled at the bottom. The crucibles were then broken away and the impure glass at the top and bottom chipped off, leaving a lump of glass, which was then broken up and softened so that it could be rolled into thick rods. These rods were then drawn out into slender rods or hollow tubes, or rolled into flat strips, and these rods or ribbons were used by the glass-maker to produce beads, vases, or inlaid work. It is noticeable that the vases from this site were not blown, but formed by coating a core of sand with melted glass, and pressing out the foot and lip by hand, while the decoration was produced by rolling in threads of colored glass. (Consult Petrie, *Tell el-Amarna*, London, 1894.) In general, glass was used for the manufacture of small objects, and especially for the imitation of precious stones, in which the later workmen attained extraordinary skill. Cutting and engraving were also early practiced. Apart from these independent uses of glass, it was very largely employed for inlaying, while an enamel or glaze on clay, stone, or wood was a favorite form of decoration from early times. A very large proportion of the scarabei, amulets, and small ornaments found in Egypt or exported to foreign parts are of various earths covered with a vitreous glaze, producing the ware incorrectly termed 'Egyptian porcelain.' However empirical the methods of the Egyptians, there can be no doubt of the technical skill attained, and even in Roman times the Alexandrian glass-workers maintained their preëminence. It was not till the Hellenistic period that value seems to have been set on clear glass, for though known earlier, it is certain that Egyptian taste valued only the highly colored varieties.

PHENICIA. Tyre and Sidon were celebrated for their glass, and Pliny (*Hist. Nat.*, 36, 190) locates its invention at the mouth of the river Belus in Phœnicia. His story is that the crew of a ship laden with nitre landed at this point, and when preparing to cook their food found no stones on which to rest the kettle. They therefore used lumps of nitre from the ship, and as these were fused with the fine sand a stream of liquid glass flowed out. Glass was certainly known long before the Phœnicians manufactured it, and the heat of an ordinary fire would be quite insufficient to fuse glass, but the fact remains that the river Belus was always an inexhaustible mine for ancient glass-workers, and modern travelers still describe the white sands heaped on each side of the stream. The glass-factories of Tyre and Sidon were among the most noted of ancient times and remained conspicuous under the Ro-

man emperors. Sidon is credited with the invention of mirrors. She certainly produced the best in the world in her time, and knew the value of manganese in making glass clear. The artisans of this city used the blowpipe, the lathe, the graver, and the casting-plate with splendid results. But the Phœnicians did little more than carry on the processes learned from the Egyptians. They were not great artists, but skillful fabricators and traders, and as a result their glass is found throughout the Mediterranean. The date of any single piece is usually hard to determine, nor is it of great importance, as there are but slight variations in style at different periods and little advance in technical skill. Indeed, it is often impossible to say whether a specimen is of Phœnician or Egyptian manufacture, and some authorities maintain that there are no unquestionable examples of Phœnician glass before the Græco-Roman period.

ASSYRIA AND BABYLONIA. Though glass is scarcely found in the Mesopotamian ruins, glazed or enameled bricks, statuettes, and small objects are numerous. Transparent glass was also known, and a fine example is the bowl of transparent green, now in the British Museum, bearing the name of King Sargon (B.C. 722). This bowl is not blown, but turned and cut from a lump of cool glass. It seems probable that this and other objects of transparent glass are importations from Phœnicia.

PERSIA. The use of enameled bricks for wall decorations was continued by the Persian kings, and the Louvre contains parts of the friezes representing lions and the royal guard which adorned the palace of Xerxes at Persepolis. The beautiful enamels of Persia are famous, and her delicate, lace-like porcelain, filled with transparent glass, is celebrated as Gamberon ware. In the Paris Bibliothèque is the famous cup of Khosru I., King of Persia (A.D. 532), a shallow bowl of crystal with the monarch's figure in relief in the central medallion, encircled with disks of red and white alternating with green, the whole glass ornamented in relief and bound with gold.

CHINA AND INDIA. The Chinese claim that glass and even lenses were known and manufactured by them as far back as B.C. 2000, but the claim is most improbable, and it is not likely the art was introduced before the Christian Era. Modern Chinese glass-works imitate agate and other stones beautifully. All their glass is made from pulverized quartz, as is done in Japan and India. The Hindus, Siamese, and Chinese have from time immemorial placed lumps of glass on the high parts of their buildings to avert lightning. Indian enamellers have been celebrated from ancient times, but they work with simplest processes. The mosaic industry of Agra originated in the Taj Mahal, for which Italian artists were imported. Glass has never been used for windows in the far East, except rarely in palaces, and to the present day oiled paper is the usual glazing throughout China, the palace windows being usually filled with mother-of-pearl or tortoise-shell.

GREECE. Homer does not mention glass (unless the word *κλῆρος*, *kyanos*, denotes a blue glass paste, such as decorated the alabaster frieze found at Tiryns), but excavations have shown that beads and such small objects were known in Greece during the Mycænæan period, though no

fragments of glass vessels have been discovered. It seems probable that these objects were imported, as there is no trace of the manufacture of glass on Greek soil, even in much later times. Even the word *balos* is not used in the sense of glass before Aristophanes (B.C. 425), and then it refers to vessels used at the Persian Court. In later times undoubtedly Greek artistic training exercised a powerful influence upon the glass-makers, some of whom bore Greek names, but the industry never became Hellenic, and Egypt, especially Alexandria, and Syria remained until Roman times the chief sources for fine glass.

ROME. In Italy glass first appears at the very beginning of the Iron Age, in the cemeteries of the Villanova type, naturally in the form of beads and other paste ornaments. Glass bowls and bottles, however, are found in Etruscan tombs, and with the extension of the Roman power the use of glass increased enormously. Not only was glass imported from the old seats of this industry, but the manufacture was introduced into Italy, and thence into the provinces of Gaul, Spain, and Germany. Here, as in Italy, glass and iron had been introduced together, but only ornaments, beads, amulets, etc., were purchased from traders. Under the favorable conditions the industry flourished greatly, and glass became so cheap that ordinary cups or platters were sold in Strabo's time for a farthing, and in the time of Juvenal and Martial poor peddlers traded sulphur for broken glass. On the other hand, the expensive and beautiful vessels, according to Pliny, had almost driven out the use of gold and silver. The absence of fine porcelain led to a much more extensive use of glass than in modern times, and the skill of the ancient artists was equal to the production of works scarcely surpassed in later times. In variety of shapes and in some points of technique the Venetians surpassed the ancient Romans; the special merit of the ancient workmen is in the beauty of the coloring and the skill with which the various threads or layers are combined, producing the effect of onyx and agate. The glass was *blown, cast, pressed, ground, and cut*. It was used for drinking-cups, flasks, bowls, and other vessels, for mosaics, small ornaments of various kinds, and especially for imitations of precious stones, which in many cases were finely engraved as intaglios or cameos. Two methods of decorating are of special beauty. In one the workman blew the glass in two layers, the inner of a dark color, usually blue, and the outer of white. The outer layer was then cut away on the wheel, leaving the design in white relief on the dark background, as in a cameo. The most famous example of this technique is the Portland Vase (q.v.) in the British Museum, though another fine specimen is in Naples, and fragments are very common. The second method is represented by but few specimens, all apparently egg-shaped cups without a foot. The vessel is inclosed in a network of rings of glass which are attached only by slender filaments to the surface of the cup. They seem to have been produced by cutting away the outer surface of the original vessel, an exceedingly delicate and tedious process, though some authorities hold that the outer network has been applied while soft and worked out with the forceps. See especially Fröhner, *La Verrerie Antique* (Le Pecq, 1879), an account of the Charcot Collection, with

a full historical introduction and numerous fine colored plates. More popular is Wallace-Dunlop, *History of Glass in the Old World* (London, 1883).

BYZANTIUM. Constantine, on transplanting his capital to Byzantium (A.D. 330), selected the best artisans in glass, and not only gave them studios in a quarter of the city called 'glass-making,' but caused them to be exempt from the tax levied by previous emperors. Accordingly glass-makers flocked from fallen Rome, carrying the fame and skill of the Imperial city to the East, and Byzantium supplied all Europe with *verre de luxe* until the rise of Venice. Factories were re-established in Greece, Macedonia, Phœnicia, and Alexandria, and after the Arab conquest they continued to be the sole sources of artistic glass through the Middle Ages. The early Byzantines followed classic models, often badly, but later a Byzantine school arose which prevailed throughout Europe until the thirteenth century. Mosaic art, under the impetus of Christianity, was developed to its greatest glory for mural decoration, as the Byzantines believed and demonstrated that "mosaic is the only painting for eternity." Their world-renowned specimens at Ravenna (A.D. 440) are superior to those of the Romans. In the famous Saint Sophia are mosaics made in the sixth century. On the lower walls these mosaics are of marble, and of glass cubes or tesserae on the upper walls and ceiling. These and its colored windows caused Justinian, its builder, to say, "I have surpassed thee, O Solomon." The Church of the Transfiguration, Mount Sinai, is adorned with precious Byzantine mosaics of the seventh and eighth centuries. The Byzantine churches were usually lighted by a series of small windows around the base of the dome. Some of the original plates of cast glass still remain at Saint Sophia. Colored window-glass is not mentioned till toward the end of the eighth century. A common method of inserting it, which is still practiced in the East, was to perforate slabs of marble, or even the plaster, in patterned openings and place the glass in these.

One of the terms of peace at the beginning of the eighth century between Caliph Walid and Justinian II. was that the latter should furnish a quantity of mosaic for his mosque at Damascus. A series of Byzantine mosaics extends from Constantine to Charlemagne. So late as the eleventh century, Pope Victor III. sent to Constantinople for workers in mosaic. Imitation stones were also made wonderfully well there. The blue cup at Monza (A.D. 600), three inches in diameter, said to be made of a single sapphire; the celebrated emerald table captured at Toledo in the fourteenth century, long believed to be cut from a single emerald, inlaid with gold and precious stones, and valued at 100,000 dinars; and the famous Sacro Catino of Genoa, a shallow dish which passed as one of the most sacred relics of Christendom, the veritable 'Sangraal,' the ransom of a captive king, and supposed to be cut from an emerald until pronounced green glass, in 1761, by a French chemist—were all from Byzantine factories. The precious sacrament cups of glass, used in the Church service, were theirs. They made the glass medallions circulated as test weights for money throughout the large estates of the Fatimite princes, which have been mistaken for coins. These were abolished in 888,

but Venice continued to make glass weights in 1279, as the old Greeks had done. From Byzantine centres the Crusaders brought back into Europe the manufacture of glass, and it is probably from this source that Venice received its early impulse and first lessons in glass-making.

VENICE. Refugees in Venice made glass as early as the fifth century, the abundance of excellent sand and alkaline sea-plants facilitating the industry. Saint Mark's, built in 1159, gave an impetus to mosaic work on the spot, and the taking of Constantinople (1204) drove many Greek workmen to the asylum of Venice, with Byzantine secrets. The interior walls of this church are entirely covered with glass mosaics, representing the principal events of biblical history. The work on these mosaics extended over a period of 250 years. The wonderful color effect and beauty of these mosaics have been eloquently described by Ruskin. With the rise of the Italian painters, mural painting took the place of mosaics for wall decoration, and no mosaics of importance were made after the fifteenth century. But in the meantime the Venetians had turned their attention to the production of ornamental glass, and guarded the secrets of its production with the most jealous care. In 1275 the Council of Venice prohibited the exportation of glass materials. The fear of fire abolished the furnaces, in 1291, from Venice proper to the outlying island of Murano, where the artists formed a small republic and have flourished ever since. The fame of Venetian glass-makers led other countries to tempt them away, but the Council of Ten jealously guarded the secrets of Venetian wealth. No stranger could learn the art. Any workman carrying his skill to another country was followed and ordered back. If he refused to come, his relatives were imprisoned. If he persisted, an emissary was dispatched to kill him. A wandering glass-maker called Paoli was tracked to Normandy, where he was stabbed with a dagger on which was written 'Traitor.' But the Venetian police had no power in Murano, and that island had its own codes and magistrates. Nobles gave their daughters in marriage to glass-workers, and the children were counted of the nobility. The shops of Murano formed, in 1495, a magnificent street a mile long, where every conceivable object was fashioned. The furnaces were small, a few workmen about each, which explains the diversity of design and the scarcity of pure glass, such as only long fusion in large furnaces can produce; but nowhere in the world could the precious products of Murano be matched. The vases and cups were royal presents to every sovereign. Their dishes displaced gold. Many of their wares were in patterns like madreporé coral. Their *mille fiore* was a starry mosaic of white threads combined in a blue ground. A favorite style imitated the pulp of an orange. *Vitro de trina* ware was made of twisted rods of opaque white in clear glass, and most delicate of all was their *lattice*, a lace-like network in exquisite designs. They also secured wonderful effects in mosaic, imitation gems, and cameos. All of these were simply repetitions or extensions of wonders done ages before by the Romans, Greeks, and Egyptians, which had since become lost arts, and all the lightness and wealth of color of ancient glass were exquisitely copied in an endless variety

of fantastic forms. Fishes, lions, dragons, etc., were made to assume grotesque effects with the colors of different wines. They blended two sheets of color into one. They invented aventurine and far surpassed their masters in reticulated glass. About 1300 Murano artists conceived of covering plates of glass with an amalgam of tin and mercury, and their mirrors became proverbially fine. Marco Polo prompted them to manufacture beads for African trade. These beads became very popular, and enormous numbers of them were made, so that now, wherever the trade of the Middle Ages penetrated, they may still be found. These beautiful beads contrast strangely with the vulgar and glittering productions that are now made for the similar purpose of trade with African and Indian tribes. In the early fifteenth century Panfilo Castaldi, a Venetian engrosser of deeds, made movable glass types and printed from them, and tradition says that John Faust, his friend, visited his scriptorium. Modern spectacles were invented by Salvino d'Armati, of Florence, according to the statement on his tombstone (1317). At the beginning of the seventeenth century there were 300 glass-houses in Murano, but at the commencement of the nineteenth century all were gone except a small mosaic factory. The art, however, was not allowed to die out entirely, but was cherished by a few workmen, one of whom, Radi, undertook the work of restoring some of the mosaics at Saint Mark's. Salviati, an Italian lawyer, assisted in the Radi enterprise, and with the aid of English capital two sets of workshops have been established where ancient methods and objects such as mosaics are skillfully copied, and new and beautiful work is also done. The Venetians excel in glass novelties, such as mirrors, beads, tableware, bric-a-brac, and aventurine. Their glass is very soft so that it can be spun, woven, or otherwise fashioned into the daintiest designs. In the production of a single piece, it is said, the glass may be reheated fifty times.

FRANCE. The factories of Poitiers were active during the Roman and Frankish periods, survived the Norman invasion, and were left a legacy to the gentlemen workers of the Middle Ages. Ruins of glass vases abound in the Poitiers territory, and such town names as Vieille, Verrières, Voirie, Verrines, come from their glass-works. The ancient cemeteries of Poitiers and La Vendée yield a rich harvest of glass, and fully 20,000 vases have been found at Terre-Noire, Bordeaux. The Imperial factory of Fontenay, at Forêt-Eu, cradle of all the later Norman glass-works, is supposed to have been founded in the second century, and is surely the oldest in the world. The beautiful Roman glass seen in the museums of France is thought to be of native manufacture. The Merovingian ornaments have a peculiar dynastic mark in the thin gold threads dividing differently colored layers. In 677 many Greek workmen were called to France. Normandy was the first country to give privileges to glass-workers. In the tenth and eleventh centuries four noble families received the special prerogatives of glass-workers, and these were confirmed by successive kings until the eighteenth century. Factories in other parts of France were established by gentlemen from Normandy, and the Crusaders brought back many improvements in glass-working. Charles V. gave all glass-makers exemption from taxes, and later

kings extended this privilege as well as permitting noblemen alone to labor at this art. In 1338 Humbert, Dauphin of Viennois, granted a portion of the forest of Chamborant to a glass-maker to establish factories there, provided he should furnish him 3000 pieces annually. M. Jaquin, in 1656, invented the imitation pearls which are made by lining the beads with fish-scales, instead of the old quicksilver lining, copying the uneven shapes of pearls in perfect mimicry, of all shades. Glass-painting was first developed, if not invented, by the French, the earlier artisans being content with mosaic. Painted glass windows are said to have originated in the school of Limoges, about 800, where a Venetian colony was planted. In all the old French churches the glass-maker's art was conspicuous. The windows of Saint Denis (rebuilt for the sixth time in 1108) are pronounced the oldest mosaic pictures in France. In 1665 Colbert tempted away 18 Venetian workmen, with their secrets, and founded a mirror factory in Paris, which, in 1693, was enlarged and transferred to Saint Gobain, where the manufacture still continues on a grand scale. About this time Thévert rediscovered the *casting* of plate glass, making plates 84 by 50 inches. All previous plate glass had been produced by *blowing*, and was therefore limited in size. For over a hundred years cast plate glass was to be obtained only from these makers. In 1740 a factory for French cylindrical window-glass was established, with German workmen, at Saint Quirin, which became the parent of the modern French, Belgian, and English plate-glass works. In 1823 D'Arques established the world-renowned 'crystal-lerie de Baccarat.'

GERMANY. Roman glass has been found in abundance along the Rhine, a fact which indicates the early date of local manufactures. The Frankish jewels were of Teutonic origin. In the ninth century, probably, the Germans taught glass-making to the northern nations. The bishops of early Germany specially encouraged glass-making to dispel pagan idleness with Christian industry. The inhabitants of Tegernsee, Bavaria, have lately held a festival in honor of the invention of glass-painting, which, they claim, dates from the windows of the abbey in that town, made in 999. For a long time painted glass and frescoes were the only library of the people. Lehmann, of Prague, reinvented the casting of glass in molds in the seventeenth century. In 1609 cut glass was first made by him, and it soon outrivalled Italian glass. Cut glass had been made by the ancients, but the art had probably been lost. Bnati, a glass-maker of Murano, worked three years in a Bohemian glass-house, as a porter, to learn its secret, and returned in 1739 to obtain a patent for Bohemian cut glass. Henry Schwanhard, in 1670, invented the etching of glass with hydrofluoric acid. The Electoral glass-works, near Potsdam, established in the eighteenth century, became famous for their gold ruby, invented by Kunkel (1679). Mirror-making was introduced from France in the eighteenth century.

ENGLAND. Great difference of opinion prevails regarding the origin of glass-making in Great Britain, some claiming that it was established before the Roman conquest, and others as late as the sixteenth century. French workmen, in 699, were brought over to glaze Saint Peter's,

York. Benedict established French glass-makers at Wearmouth, 675, for the building of his church; but for centuries glass-making languished in Britain. Henry III. had but one glass drinking-cup, which he specially prized. France taught England the secrets of glass-making. The oldest painted windows in England are those of 1174 in the choir of Canterbury Cathedral, which are as French as those in Saint Denis. As late as the sixteenth century oiled linen was the usual window material, and a century later the royal palaces of Scotland had only the upper rooms glazed. In 1677 the Duke of Buckingham brought glass-makers from Murano to Lambeth to manufacture crystal vases, looking-glasses, and coach-windows. The revocation of the Edict of Nantes (1685) sent many glass-makers to England, and the manufacture speedily improved. Early in the seventeenth century the greatest of modern glass inventions was achieved in England, the making of lead-flint, producing brilliant glass, which was impossible for earlier makers. The famous plate-glass works of Ravenhead were established in 1771. Toward the close of the nineteenth century the art of making glass mosaics was revived in England, largely through the efforts of Sir W. B. Richmond.

UNITED STATES. Prior to the European colonists the only glass known in America was the 'obsidian' volcanic glass. In 1608 some glass-makers were among the artisans brought to Jamestown, Va., but the craze for tobacco interfered with their industry. In 1621 several Italian glass-workers were imported to manufacture beads for the Indians. In 1639 a glass-house was erected at Salem, Mass., and William Penn alludes to a Quaker glass-house in 1683. A glass-maker, Jan Smeedes, received an allotment of land on Manhattan Island, and the business which he carried on gave the name 'Glass-makers' Street' to the present South William Street of New York. In 1754 a Dutch gentleman, Bamber, built glass-works in Brooklyn, N. Y., and the first bottle blown by him, bearing the name and date, is in the collection of the Historical Society of that borough. Glassboro, N. J., was founded by a colony of German glass-makers, who moved there in 1775. In 1787 the Massachusetts Legislature gave to a Boston glass company the exclusive right to make glass in the State for fifteen years. This is said to have been the first successful glass-factory in the United States. Pittsburgh, Pa., first made glass in 1796, and is still a most important glass-making centre. At the very beginning coal was used instead of the traditional wood fuel. This, with the abundance of excellent sand in the adjoining rivers, gave the industry a phenomenal development there, which has been increased by the substitution of gas and oil fuel. In 1827 pressed glass was invented by a carpenter of Sandwich, Mass. With the discovery of a cheaper and better fuel, in the form of natural gas, the centre of glass-making moved west of the Alleghanies, where it still remains. As natural gas has failed, petroleum has been substituted, and proves an excellent fuel. By the close of 1880 the census shows that the glass industry of the United States had been brought to a very extensive and prosperous condition. There were then 211 factories, employing 24,177 men, sending out an annual product worth \$21,154,571. In 1890 the number of

factories had increased to 294, and the product to \$41,051,004, and in 1895 the product was \$47,600,000. Within recent years artistic glassware of great beauty has been produced in the United States, a notable example of which is the famous 'Favrille' glass of the Tiffany Company of New York. The United States still imports more glass than she exports, the exports being that peculiar product of Yankee ingenuity—pressed glass.

aluminum, and calcium; *Venetian glass*, of sodium, potassium, and calcium. Sodium, potassium, calcium, and lead are the bases that form almost all glasses. To obtain the silica, sand is now generally used, river or sea sand sufficing for cheap grades, in spite of the impurities; but for fine qualities the sand is quarried. American sand is pronounced by experts superior to English and French. The principal deposits are in Massachusetts, Pennsylvania, West Virginia, Illi-

GLASS INDUSTRY IN THE UNITED STATES, 1850-1900
(From Twelfth Census)

	Date of census					
	1900	1890	1880	1870	1860	1850
Number of establishments.....	355	294	169	201	112	94
Capital.....	\$61,423,903	\$40,966,850	\$18,804,599	\$14,111,642	\$6,133,666	\$3,402,350
Salaries officials, clerks, etc., number.....	2,268	1,095*	†	†	†	†
Salaries.....	\$2,792,376	\$1,232,561*	†	†	†	†
Wage-earners, average number.....	52,818	44,892	24,177	15,822	9,016	5,668
Total wages.....	\$27,084,710	\$20,885,961	\$9,144,100	\$7,846,425	\$2,903,832	\$2,094,676
Men, 16 years and over.....	42,173	36,064	17,778	11,505	8,765	5,571
Wages.....	\$24,901,233	\$19,546,351	†	†	†	†
Women, 16 years and over.....	3,529	1,885	741	715	251	97
Wages.....	\$840,001	\$332,245	†	†	†	†
Children, under 16 years.....	7,116	6,943	5,658	3,602	†	†
Wages.....	\$1,343,476	\$1,007,365	†	†	†	†
Miscellaneous expenses.....	3,588,641	2,267,696	†	†	†	†
Cost of materials used.....	16,731,009	12,140,985	\$8,028,621	\$6,133,168	\$2,944,303	\$1,556,833
Value of products.....	56,539,712	41,051,004	21,154,571	19,235,862	8,775,155	4,641,676

* Includes proprietors and firm members, with their salaries; number only reported in 1900, but not included.
† Not reported separately.

VALUE OF GLASS IMPORTED AND EXPORTED

YEAR	Imports, total value	Exports, total value
1900.....	\$5,037,931	\$1,936,119
1899.....	4,303,660	1,503,651
1898.....	3,782,617	1,211,064
1897.....	5,603,868	1,208,187
1896.....	7,528,420	1,062,225
1895.....	6,637,473	946,381
1894.....	6,288,697	922,072
1893.....	8,062,639	973,827
1892.....	8,828,952	942,302
1891.....	8,463,935	868,374
1890.....	7,411,343	882,677
1889.....	7,734,662	894,200
1888.....	7,867,263	881,628
1887.....	7,3 6,771	883,504
1886.....	6,358,085	773,878
1885.....	6,256,194	783,915
1884.....	7,552,498	839,756
1883.....	7,762,543	996,857
1882.....	6,634,371	864,235
1881.....	5,878,025	756,022
1880.....	5,221,511	749,866
1879.....	3,222,479	768,644
1878.....	3,345,149	869,682
1877.....	3,936,786	658,061
1876.....	4,906,948	628,121
1875.....	5,805,115	691,310
1874.....	6,257,904	631,827
1873.....	7,420,044	627,562
1872.....	5,834,712	547,112
1871.....	4,269,620	466,447
1870.....	4,157,634	530,654
1869.....	3,895,739	580,718

CHEMICAL AND PHYSICAL PROPERTIES. Chemically, any vitreous compound is called glass, but commercially glass is a fused mixture of two or more metallic silicates, and is often named from the predominant base, as 'soda glass,' 'potash glass,' 'lime glass,' and 'lead glass.' The essential ingredients are silica and alkali. *Flint glass* is a mixture of the silicates of lead and potassium; *Bohemian glass*, of the silicates of potassium and calcium; *plate or sheet glass*, of the silicates of calcium and sodium; *bottle-glass* is a mixture of the silicates of sodium,

nois, Missouri, Ohio, Indiana, New Jersey, New York, and Maryland, but good sand is abundant all over the United States.

Ancient glass was commonly a soda glass, one part of sand to three of crude soda, and, therefore, was soft, decomposing easily. The inferior soda, made from the ashes of sea-plants, was succeeded by soda-ash, made from salt by Leblanc's prize discovery of 1792, which opened a new era in glass-making. Since 1875 'salt-cake,' sulphate of soda, has been largely used, producing a harder glass of a bluish color, while the carbonate of glass is softer and yellowish. The use of potash as an ingredient dates from the Middle Ages. It is made from the mineral chloride by the Leblanc process, similar to the manufacture of soda-ash from salt. Lime, next to silica in importance in producing toughness, is a modern discovery. Of old, it was used sparingly as a cheap substitute for soda and potash; now, with improved facilities, it produces 'lime-flint,' unequalled for lightness and beauty in common wares. It is used in the form of carbonate of lime, which is a staple compound, while burned or slaked lime constantly changes its chemical composition. Lead oxide (litharge) began in the seventeenth century to produce the heaviness and brilliancy of the English flint glass now made in every industrial country. Another oxide of lead, called red lead, is also used in modern glass, and is said to be preferable on account of its excess of oxygen. Other ingredients, as barium, zinc, and lithium, are used in special glasses. Manganese is introduced in modern glass as a decolorizer, to correct the greenish tint produced by iron, which is an unwelcome ingredient of nearly all materials. Arsenic, and carbon in the form of charcoal or coal, are aids to the decomposition of the batch. The proportions of the ingredients differ widely among various establishments.

Potassic silicate is colorless, and contributes brilliancy and fusibility; sodic silicate is also bright and fusible, but imparts a sea-green tint; plumbic silicate increases the fusibility, ductility, and brilliancy of glass. If an excess of any material is used it affects the quality of the glass. Too much alkali tends to make the glass spotted, scaly, rough, or cordy; excess of lime

Molten glass is an amorphous substance, but when allowed to stand undisturbed for hours it will crystallize. This process is called devitrification. The accompanying table, showing the components of different varieties of glass, was taken from an article on "Glass," by Robert Linton, in *The Mineral Industry*, for the year 1899 (New York, 1900):

CHEMICAL COMPONENTS OF DIFFERENT VARIETIES OF GLASS
(From *The Mineral Industry*, 1900)

COMPONENTS	Window-glass					Plate glass				Lead flint (cut glass)			
	American	Belgian	German	English	French	American	French	Belgian	English	American	Belgian	French	English
	%	%	%	%	%	%	%	%	%	%	%	%	%
SiO ₂	72.26	69.48	72.68	71.40	69.65	71.2	72.1	72.4	78.64	63.76	53.70	52.41	51.4
Al ₂ O ₃	1.42	2.59	1.06	1.90	1.82	1.0	.....	.....	2.68	0.90	1.07	0.96	.....
Fe ₂ O ₃	13.34	13.40	12.76	12.40	13.31	14.2	12.2	13.2	6.09	0.31	0.59	0.77	.....
CaO.....	.....	0.26	0.26	.....	.....	.....	.....	.....	.....	21.93	34.91	35.24	37.4
MgO.....	14.01	14.55	13.24	15.00	15.22	13.9	15.7	14.4	11.63	12.16	9.12	10.87	.....
Na ₂ O.....	.....	.....	.....	.....	.....	.....	.....	.....	1.34	.....	0.30	.....	9.4
K ₂ O.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

COMPONENTS	Lime flint (prescription)				Green bottle			Cham-pagne	Jena				Strass
	American	English	German	French	American	German	French	French	Thermom-eter glass	Combustion tube	Verbund-glass	Chemical	French
	%	%	%	%	%	%	%	%	%	%	%	%	%
SiO ₂	73.96	.....	75.61	69.6	69.82	80.4	63.34	61.90	67.30	66.61	71.95	74.07	38.2
Al ₂ O ₃	0.44	.....	1.01	5.2	2.58	10.4	4.72	4.41	2.60	3.53	5.00	1.20	1.0
Fe ₂ O ₃.....	.....	.....	.....	.....	.....	3.8	4.42	1.85	.....	.....	.....	.....	.....
CaO.....	13.94	.....	7.38	13.0	7.82	20.7	21.34	17.95	7.00	11.81	.....	8.25	.....
MgO.....	0.41	.....	.....	.....	.....	0.6	.....	6.38	.....	.....	.....	.....	.....
ZnO.....	0.18	.....	4.84	.....	.....	.....	.....	.....	.....	.....	.....	.....	53.0
K ₂ O.....	.....	.....	11.39	8.0	1.50	.....	2.01	1.13	.....	.....	.....	7.47	7.8
Na ₂ O.....	10.85	.....	.....	3.0	18.28	13.2	4.17	6.16	14.00	6.56	11.00	8.63	.....
ZnO.....	.....	.....	.....	.....	.....	.....	.....	.....	7.00	1.30	.....	.....	.....
BaO.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.20	.....	.....	.....
B ₂ O ₃.....	.....	.....	.....	.....	.....	.....	.....	.....	2.00	7.99	12.00	.....	.....

prevents cords, but tends to make the glass brittle and liable to devitrify; if there is too much sand it is impossible thoroughly to melt the glass, and it is full of stones, seeds, strings, and other imperfections. The imperfections so common in flint glass are due to the fact that it is composed of the silicates of lead and potassium, materials so different in their specific gravities that when fused together veins and cords are likely to be produced. It is this tendency which makes a perfect optical flint glass so hard to produce. The specific gravities of various kinds of glass are as follows: Window-glass, 2.50 to 2.70; plate glass, 2.40 to 2.50; bottle-glass, 2.60 to 2.70; lead-flint glass, 2.80 to 3.25. Hydrofluoric acid is the only acid known which will dissolve glass. Glass is slightly acted on by alkaline solutions, by light, air, and boiling water. It is usually transparent, or at least translucent.

The most important property of glass, however, is the condition of viscosity, intermediate between solidity and liquidity, which it assumes when the ingredients of which it is composed have been thoroughly fused and are maintained at the proper temperature. In this semi-liquid state it may be blown into any hollow form like a bubble, spun into the finest thread, or pressed or cast into any desired shape. This property of glass will be considered farther on as the different methods of manufacture are described.

PREPARATION OF THE MATERIAL. Sand being the commercial representative of silica, it is evident that the quality of glass depends, apart from the effect of different processes of manufacture, upon the quality of the sand, and the more thoroughly the sand can be cleansed of impurities before it is melted, the better will be the quality of the glass. Hence, for the finer qualities of glass, the sand is often subjected to a preliminary process of purification by washing, burning, and sifting. The sand is *washed* by stirring it thoroughly in large volumes of water and then allowing it to settle; the lighter particles of dirt, chalk, and other extraneous matter will remain in suspension after the heavier sand has settled, and can be drawn off. The sand is *burned* to remove the moisture and organic matter; it is placed in the bed of an oven and played upon directly by the flame. Last of all, it is *sifted* through copper gauze. The chief impurities found in sand are iron, lime, alumina, chalk, and magnesia, besides organic matter and dirt. Of these the iron is the most troublesome, so that it is customary to estimate the value of sand according to the amount of iron which it contains.

The process of mixing the prepared sand with the other ingredients is called 'mixing the batch,' the batch being the mechanical mixture of the materials whose chemical combination, brought

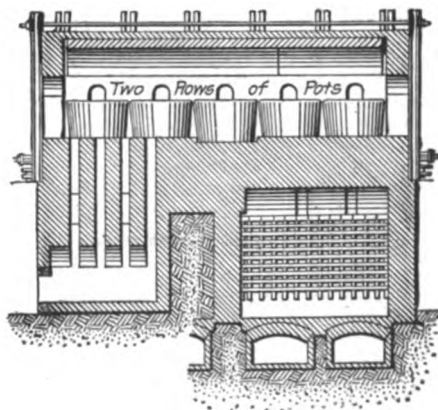
about by heat, produces glass. It is evident that the materials of which glass is to be made must be mixed with the greatest nicety, knowledge, and skill, if a perfect product is to be obtained. Herefore the proportioning of materials has been done empirically, but in the best modern factories there is more dependence put upon chemical analyses to determine the proper mixture. The accompanying table, compiled from figures in *The Mineral Industry*, previously referred to, shows the mixes for American glass as prescribed in three different glass-makers' recipe-books. While it is true that a practical glass-maker might not follow any of these recipes exactly, but would have to modify them to suit the peculiar requirements of his own material and furnaces, yet they will serve to give a general idea of the average composition of the batches from which some of the different kinds of glass are made in America.

RECIPES FOR AMERICAN GLASS

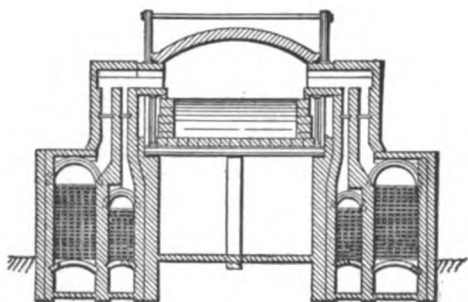
	Window-glass			Plate glass			Green bottles			Lead flint	
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sand.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Salt-cake.....	44.0	40.0	42.0	.....	.....	40.0	.....	.....	38.0	.....	.....
Soda-ash.....	.....	4.0	.....	30.0	36.0	.....	38.0	35.0	.....	.....	.....
Limestone.....	26.0	38.0	40.0	24.0	24.0	38.0	36.0	32.0	34.0	.....	.....
Carbon.....	4.0	8.0	6.0	1.0	.75	4.0	.....	.....	.....	.....	.....
Arsenic.....	2.0	1.0	2.0	.....	1.0	2.0	.....	.....	.....	0.5	0.15
Charcoal.....	.....	.....	.....	.....	.....	.....	.....	.....	5.0	.....	.....
Potash.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36.0	34.0
Red Lead.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40.0	48.0
Nitre.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5.0	6.0
Borax.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.3	0.06
Antimony.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.02

FURNACES AND FUEL. The furnaces used for melting glass are of two general types, pot furnaces and tank furnaces. The traditional furnace, still the type of pot furnace for flint-glass melting, is round, with from eight to twelve 'monkey pots' in a circle around the central fire, at the base of an enormous chimney. The monkey pot is an oval cylinder with a round top, open only on the upper part of one side. Each one is inclosed in an arch of fire-brick, with its mouth only visible outside, and when it cracks the heat must be lowered and the arch torn down, while the red-hot crucible is dragged out and another substituted for it. The melting-pots play a very important part, and demand the most careful preparation. The slightest flaw is discovered by

mens, and this type of furnace is in wide use in Europe and America.



REGENERATIVE OPEN-POT FURNACE.



SECTION OF WINDOW-GLASS TANK FURNACE, BAUDOUX-PAGOULET TYPE.

the intense heat, and the precious contents are emptied into the well below the furnace. The clay is most carefully selected, but after months of labor in its construction, the monkey pot

In these furnaces the gas is generally produced from coal outside of the furnace, mixed with the air, on the principle of the Bunsen burner. In the United States natural gas, and later on petroleum, have been largely used as a fuel. Instead of melting-pots there is a tank, constructed from pot-clay, covering the whole area of the furnace, and divided by floating partitions into compartments. The melting compartment at the rear receives the raw material through the doors. As this melts it flows into the refining compartment, where a higher temperature purifies it till it flows under the second partition into the gathering compartment, and there a lower temperature thickens it for the blower. A re-

cent improvement dispenses with the floating partitions by the use of floating vessels, which gather the molten glass at the lowest depths in the tank and raise it to the surface to be completely refined in a special compartment, whence, as it sinks in perfect fusion (the best glass being the heaviest), it can only flow into the working-out compartment. The depth of the floaters is usually one-fourth the depth of the tank. These tank furnaces may be worked continuously, with no change in temperature, and no discoloration from smoke, and on a colossal scale.

Improvements in the methods of glass manufacture have all been in the direction of substituting gaseous for solid fuel. Even in pot-furnaces gas is preferred, and for a tank furnace it is indispensable. Natural gas is the ideal fuel, but is very limited in its occurrence, and when it cannot be obtained gas is manufactured from other fuel. Its advantages are its freedom from ashes and other dirt, and the ease with which the flame may be applied and controlled. A commercial classification of glass and of the principal types of furnaces producing it may be given as follows: (1) *Polished plate* embraces all glass cast upon a smooth table, rolled to the required thickness with a roller, annealed, and then ground and polished. Under this head comes *thin plate*, a recently developed process. (2) *Rough plate* includes all glass cast as above, but not ground and polished. The principal varieties are *ribbed plate*, *colored cathedral*, *rough plate*, *wire glass*, *heavy rough plate* for skylights. (3) *Window-glass* embraces all glass blown in cylinders and afterwards cut and flattened out and polished while hot. Chiefly used for pictures and mirrors. (4) *Crown glass* is glass blown in spherical form and flattened to a disk shape by centrifugal motion of blowpipe. A little is now made for decorative purposes. (5) *Green glass*. All the common kinds of glass, and not necessarily green in color. Used in manufacture of bottles, fruit-jars, etc. (6) *Lime flint* includes the finer kinds of bottle-glass, certain lines of pressed tableware, and many novelties. (7) *Lead flint* embraces all the finest products of glass-making, such as cut glass, fine tableware, artificial gems, and optical glass.

The principal furnaces are: (1) Open-pot furnaces for bottles and window-glass; (2) open-pot furnaces for plate glass; (3) covered-pot furnaces for flint glass; (4) day-tanks, which are practically open-pot furnaces, gas-fired, and with a single tank or pot; (5) regenerative continuous tank furnaces for window-glass; (6) regenerative continuous tank furnaces for bottles; (7) recuperative continuous tank furnaces for bottles.

MANIPULATION. The curious viscosity assumed by molten glass has already been referred to. While in this condition it may be gathered up in a soft mass on the end of a stick, and, if the stick be a tube, the lump may be distended, by blowing through the tube, into a hollow sphere. The form of this sphere or bulb may be modified by manipulating the pipe, and if a second iron be attached by a seal of glass to the other side of the bulb, it may be drawn out into a tube. If the bulb be opened by removing it from the blowing iron, and then, after attaching it at its opposite side to another iron, be trundled rapidly like a mop, the opening will expand, by centrifugal force, into a disk. These are the

processes which, infinitely diversified and complicated by the skill of the workmen and the nature of the product, constitute the art of the glass-blower. Every melting-furnace has several working furnaces called 'glory-holes,' where the glass-worker reheats his work. These are small blast-furnaces, each affording several openings into the flames.

There are three general methods of shaping glass—by blowing, pressing, and casting.

WINDOW-GLASS is produced in a square or oblong furnace, and requires the most muscular and skillful workmen. The 'monkey pots' are filled with the mixed 'batch,' and when this is melted a second charge is shoveled in, followed, as soon as it flows, by a third and a small amount of 'cullet' (broken glass), which fills the pots. Sixteen hours are consumed in the entire melting, and the master-melter carefully watches his 'monkeys,' forcing the furnaces to their highest heat. As soon as the signs appear indicating that the molten glass or 'metal' is ready to work, the heat is lowered to thicken the glass for the blowers. Each man is trained to one small part of the whole process, and does nothing else. The gatherer holds a mask before his face, by a plug grasped between his teeth, to screen him from the glare of the furnace, and starts the 'journey' of the glass by dipping the blowpipe into the pot several times, dexterously forming on its end an oval mass of the white, hot, gummy 'metal,' which weighs from 20 to 40 pounds, according to the thickness and size of the sheet to be made. Revolving the ball in the glaring pot, he completes its symmetry and consistency, and then turns it in an iron mold till it takes a perfect pear shape. This finishes the gatherer's work, and he hands the fiery sphere to the blower, who is the master-workman of the establishment. He takes the pipe from the gatherer's hand and blows a huge bubble of air into it, then another, and another, swelling the solid sphere into a great decanter, with its thinnest part hardening next the pipe, as one end of the cylinder which is to be evolved from the soft thick mass attached to it. Now he takes his stand on the long narrow platform which leads to his furnace door over a deep pit, swinging the glowing bulb like a giant pendulum into the depths below, persuading it to elongate with frequent puffs at the most effective moments. Now and then, as it cools into hardness, he rests his pipe on a prop and softens the end in the furnace, or he may toss the cylinder above him until it settles into a workable condition. Thus he blows and swings, and heating from time to time the molten mass, he works it till it grows as long as himself and becomes a round-topped cylinder. When this has cooled considerably, he holds the end in the furnace, blows strongly into it, and, covering the mouthpiece with his thumb, an explosive report is heard. The imprisoned air, heated expansively, has burst an opening through the soft extremity. Revolving the end rapidly in the furnace, the blower enlarges the hole by centrifugal force, till it is as large as the diameter of the cylinder. Then he cools it in a pit to a cherry-red, and his part is done. An assistant carries it off and detaches it from the blowpipe by encircling the neck with a thread of hot glass and then touching the line with a cold iron. The cylinder is then cracked lengthwise by a diamond, or by passing a red-hot iron inside it. Next the

flattener takes it. First he warms the split cylinder, then places it on the stone before him, a fire-clay table, which revolves within an oven. The curved sheet opens in the heat like an uneven sheet of paper, and he smooths it by a wooden block. The stone carries it then to the cooling oven, whence it is lifted on an immense fork into a car at the mouth of the 'leer,' or annealing tunnel, and there it is tempered for service.

CROWN GLASS, once the favorite for window-panes, has now shrunk into small importance, and is made for ornamental work only. Though much more brilliant, the plates are small and of tapering thickness. The same molten material as that used for sheet glass is gathered in a smaller globe on the end of a blowpipe, and rolled into a cone on a stone table, or 'marver.' The workman blows it then into a sphere and flattens the under side of it, keeping in the centre the 'bullion point,' or thick apex of the original cone. While he rests the pipe on a horizontal support, another workman with a 'pundy,' or solid iron rod, attaches a small cup of warm glass to the bullion point, and the blower detaches his pipe by touching the neck of the flattened globe with a cold iron and quickly striking it. The pundy-man carries it off with a small hole where it left the blowpipe, and heating it in the furnace and revolving it, the opening enlarges wider and wider until it becomes the 'crown,' which named it, and at last whirls out into a flat disk or 'table.' This is kept incessantly turning till it cools enough to be laid on a support, where it is clipped by shears from the rod, and sent to the annealing-oven. The diameter of such a plate varies from a few inches, like those made in colored glass for fancy windows, to six feet. But the square panes cut from it are always small, as the round lump in the centre, the 'bullion point,' or 'bull's-eye,' must be omitted, though these are sometimes used for decorative purposes.

PLATE GLASS has the same composition as sheet and crown glass, but is melted in vast open vessels (sometimes holding 2½ tons) resting upon frames behind fire-clay doors. After the long fusion is perfect the door is thrown open and the tank is seized by an immense fork mounted on a truck, and carried bodily to the casting-table, where it is hoisted by a crane and poured over the metal bed, which has a very smooth, highly polished surface. A heavy roller passes over it, spreading the glass out in a uniform thickness determined by the height of the strips on either side of the table. Instantly it is rolled into the annealing-oven for a tempering of several days. It comes out in the form of rough plate. To be polished it is fastened by plaster of Paris to a large rotary platform which revolves so that the entire surface is covered at each rotation by the disks of grinding-machines which rub it with sand, then with emery, and last with rouge, first on one side, then on the other, till 40 per cent. of its thickness is removed, and it remains a shining sheet from one-quarter to three-eighths of an inch thick. 'Rolled plate' is cast upon an engraved table, which gives the impressions of fluted lines or fancy patterns in a translucent body of glass adapted to panels and partitions.

GREEN GLASS, or BOTTLE-GLASS, is the coarsest form, made from roughest materials, and is the simplest branch of glass-work. The bottle-blower gathers the molten glass on his blowpipe, in the quantity desired for his bottle, or jar, or demi-

john, puffs a bubble into it, drops the inflated lump into an iron mold, which is closed together over it by a small boy, and blows the glass into its permanent shape with the lettering or trademark which was cut in the mold. The jagged mouth is then rounded in the 'glory-hole,' and the bottle goes to the 'leer.' Bottle-molds are made of brass or iron, and must be maintained at nearly a red heat while being used. The simplest form is of two sides hinged together at the base, and the familiar ridges running up each side of a glass bottle are formed where the two sides of the mold shut together. Sometimes the mold is in three pieces, one for the body and two for the neck, in which case the ridges are only on the neck; this is usually the case with wine-bottles. Formerly the blowing of bottles was done wholly by the breath; but recently machines for blowing fruit-jars and other wide-mouth jars have been successfully operated, and the process will doubtless be extended.

FLINT GLASS broadly includes all the myriad forms of glass except window-panes and dark bottles. The lead, which the true flint glass alone contains, gives it a characteristic brilliancy and weight. The pure English flint is the French 'crystal.' It rings like metal, is heavier than any other glass, and shines as none did before its invention. It is the choicest material for table and cut ware, for optical glass, and for the best blown and pressed ware that fills the household. An extra proportion of lead makes it 'strass,' from which artificial gems are made. The 'lime-flint' has a lighter weight and a lustre approaching 'lead-flint,' but it does not equal its royal superior. From this the ordinary utensils are made.

A flint-glass establishment is the most fascinating of glass-houses, as it generally includes blowing, molding, and pressing. A wine-glass is made from a glowing bulb as large as a peach. A breath swells it into a hollow sphere the size of the bowl. The gatherer attaches a small knob of soft glass, and draws it out into the stem, and on the end of this presses a bell-shaped base, previously hardened, which is flattened out into a stable foundation. Shears cut free the top of the bowl, and the furnace rounds the edge. So, from three pieces, the ordinary wine-glasses and similar-shaped vessels are made. The costlier kind has the stem drawn out of the original sphere, and the base, blown separately like a tiny disk of crown glass, is united by its heat to the upper part. All the best 'hollow ware' is blown either in the air and finished by hand for the higher grades, or in molds, which produce the dimmer surface of common qualities. All transparent druggists' or prescription bottles are of flint glass, but are made like the green glass bottles. A good workman can blow 4800 small 'prescriptions' in a day of ten hours. The combination of colors in flint-glass work is particularly interesting. From the pots, where several hues of glass are fused adjacently, the blower dips two or three contrasting layers, all appearing one, and works them as a single lump into a globe, or shade, or vase. These can be cut in cameo style, or twisted into ingenious displays of their structure. The fancy vases, globes, pitchers, etc., with high or low relief patterns, are blown into molds and finished by hand. The perplexing skein-work of interlaced threads of color in a body of transparent glass is produced by wind-

ing threads of colored glass, which are then shaped into any hollow pattern or pressed solid into pretty marbles. Machinery has been used with marked success in the manufacture of tumblers and lamp-chimneys, and compressed air employed instead of the breath of the glass-blower.

CUT GLASS is first blown into the general shape intended from the brilliant 'crystal,' and then is ground into a cluster of glistening facets. Grindstones, continually moistened by streams of wet sand, cut the rough pattern, and emery wheels, and, finally, putty powder, finish the brilliant angles. The grinding-mills also remove the punty-marks and defective ridges on wine-glasses, etc. 'Ground glass' is made by roughening the surface on these wheels, or by sand-blast, or by etching. The last is done by hydrofluoric acid, often in designs for translucent doors and windows, the unetched part of the glass being protected by a coat of wax. The ornaments on fine drinking-glasses and shades are engraved by copper disks.

PRESSED GLASS, the least expensive and therefore the most abundant form of flint glass, is the American contribution to the industry. The pressing-machine contains a mold of the ink-stand, dish, goblet, vase, or statue to be made, and one man cuts off and drops into it a lump of red-hot glass, while another pulls the lever which shapes the object. By this means unskilled labor can produce perfect results, and the process of manufacture is wonderfully shortened. Pressed glass is often made to imitate Bohemian cut glass, the facets being cast instead of being cut, but the angles are always rounded and the lustre less.

Beads are still made almost entirely in Venice, where over a thousand artisans are devoted to this work alone. The glass is drawn out into long tubes which are filled with sand to prevent their collapse when annealed, and are then cut off into fragments. Colonies of women and children thread them and tie them in bundles to be exported to the ends of the earth. The 'pearl beads' of France, invented by Jaquin in 1656, and made ever since by his heirs, are blown from glass tubes, lined with powdered fish-scales, and filled with wax. The scales of 16,000 fish are required to make one pound of essence of pearl. The finest of them simulate the irregularities of pearls in form and color, and are difficult of detection without special tests.

Imitation gems, long the favorite object of the cleverest artificers, are now nearly obsolete. The base of false gems, 'strass,' is a heavy uncolored flint glass, containing an abnormal proportion of lead to give it weight and brilliancy. See **GEMS, IMITATION**.

COLORLED GLASS is made ordinarily like any others, by the addition of dyes (generally metal oxides) to the molten charge. The same metal produces several colors at different temperatures. Iron gives all the rainbow hues in the order of their position in the spectrum, but its commonest effects are green and orange. Manganese, so staple a decolorizer as to have earned the name 'glass-makers' soap,' produces in excess pink or amethyst. The manganese in old window-glass frequently is betrayed by the analysis of long sunlight in the purple tints that appear. Too high a temperature turns it brown, then yellow, and finally green. Copper makes the reds of

cheap glass, and when heated further turns purple, blue, and green. Cobalt gives rich blue or black. Gold, in the form of 'purple of Cassius,' and in a simple solution, creates the finest rubies, violets, and amber, one part of the precious metal coloring a thousand parts of glass. The exquisite objects of amber glass which shade into red are colored from a gold solution in the crucible, and after being fashioned into the desired shape are held in the 'glory-hole' a few minutes. The second heat transforms the amber to red and the unheated portion remains an amber tint. Silver gives a beautiful yellow, and uranium, green or yellow. Carbon, in powdered coal, is used for cheap black and amber bottles. Opalescent ware, in which modern fancy glass excels, gets its color from cryolite, arsenic, or tin.

Mosaic window-glass is cast like rough plate glass from small ladles, and the desired tints are carefully selected, to be patched together in harmonious designs by leaden joints. See **WINDOW**.

Painted glass is colored by enamels fused to the surface. Stained glass is produced by soluble metal oxides applied with a brush and fastened in the stainer's kiln. 'Flashed glass,' or double glass, is made by coating the embryonic bulb of transparent glass with a dip of colored glass and blowing both as one into a sheet of window-glass, a lantern-globe, or whatever shape is desired. Opaline glass for art windows is made by pouring colored glass of one or more kinds upon white opaque glass and then pressing the whole with a heavy iron roller. This causes the different glasses to intermingle, affording great varieties of color effect. See **STAINED GLASS**.

OPTICAL GLASS is a fine quality of lead-flint, as the density produced by lead causes high refractive power. The fusion, like the whole finishing work, requires special care and patience. The melting-pot is lined with a glaze of broken glass, having been previously very slowly heated for four or five days. The batch is put in a little at a time, and stirred with a fire-clay roller. The molten mass is kept at an intense heat for six or eight hours and stirred, to cause all the bubbles of gas to escape, the process being continued till there are no more bubbles. The pot of glass is now taken from the furnace and put in an annealing-oven and slowly cooled for several days. The glass is then broken up into pieces, the faulty ones rejected, and the perfect ones charged in disk-shaped clay molds, where they are remelted to the form of the mold. These glass disks are now ready for the final annealing, which is performed very slowly and with great care.

WIRE GLASS. Wire glass is simply a combination of wire and glass for use in large buildings like railway stations, where a single wide-arched roof must span an enormous area, and the lighting must be chiefly in this roof. It is also used for ordinary windows in exposed locations, as a precaution against fire or other accident, as the iron of which the netting is composed has a higher fusing-point than the glass in which it is imbedded. When exposed to fire it will retain its shape and hold the glass together even after the latter has become plastic. A wire-glass window forms an admirable fire-screen, and in many cases is a great protection. Ordinary glass panes in a roof are in danger of breaking and falling, and the object sought by the inventor

of wire glass was to secure a material at once lighter and stronger than the ordinary glazed roof windows. The first practical and commercially successful process was patented by Frank Shuman in 1892, and the following year he was awarded a premium by the Franklin Institute for the invention. In the Shuman process a very long cast-iron table is set in the floor and heated by gas-flames from beneath. Over this the molten glass is poured. The woven wire netting is heated nearly as hot as the molten glass. A vehicle holding four rollers and feeding out the red-hot wire is now rolled over the table on a track, one rail of which is on each edge of the table. The first roller smooths and spreads the glass, the second presses deep into the glass the wire netting which slides down an inclined iron table before the roller, the third and fourth rollers complete the process of smoothing and hardening. Wire glass is not readily damaged by vibrations, and is hail-proof. Its strength enables it to support great weights of snow and to resist flying particles that would break through ordinary glass.

ANNEALING has been referred to already, but it is such an essential part of the art of glass-making that it requires more detailed explanation. In order that glass shall have strength and durability, it must, after it has been fashioned into shape by some process, be cooled more gradually than is possible in the temperature of the open air. This is necessary in order that the pores, which have been distended by heat, may contract evenly throughout the substance instead of closing more rapidly on the surface than inside. In order to effect this, annealing-ovens are used in which the temperature is so regulated that the cooling proceeds with extreme slowness, as many as four weeks being required to bring optical glass to its normal temperature. Two kinds of annealing-ovens are in use, the intermittent and the continuous. An intermittent kiln is simply a gas-heated oven with a hearth on which the glass is laid. When the heated kiln is filled with ware it is sealed up and allowed to cool by draughts, which are so regulated that the temperature can be perfectly controlled at every step of the process. In annealing plate glass there is a separate oven for each sheet. Continuous kilns or 'leers' are displacing the intermittent kilns for many forms of glass. The oven is a long narrow passage with the fire at one end, so that the temperature constantly lowers as the other end is approached. An endless chain, with pans on it for holding the glass, is slowly dragged through the oven, and by the time a pan has traveled from the fire to the cold end of the oven the glass in it is properly annealed. Several processes for rendering glass still tougher than it is made in the annealing-oven have been invented. M. de la Bastie has succeeded in imparting considerable toughness to glass by plunging it, while hot, into a bath of oil or melted fat. This process has proved only partially successful, and is not adapted to window-panes, because glass treated in this way will not cut with the diamond. Another method is in the manufacture of 'Verbundglas,' or compound glass, which was originated at the works of Schott & Genossen, at Jena, Germany. The glass is made of two layers which expand at different temperatures, one of them being flashed over the other. This glass is especially adapted

for chemical vessels, thermometers, lamp-chimneys, or, in fact, for any use in which the exterior and interior surfaces are subjected to widely different temperatures.

There are many strange uses of glass. Threads may be drawn on a reel from molten glass, making a transparent mineral silk fine enough to weave into cloth, or to fashion into fancy plumage. It has been found possible to weave glass into fabrics, sometimes with a warp of silk, and to shape it into collars, neckties, brushes, lamp-wicks, etc. M. Dubus Bonnet, of Lille, France, has invented a process of spinning and weaving glass into cloth. The warp is composed of silk, forming the groundwork, on which the pattern in glass appears, as effected by the weft. The requisite flexibility of glass thread for manufacturing purposes is due to its extreme fineness, as not less than from 50 to 60 of the original strands form one thread. *Mineral wool* is made from the slag-glass refuse of iron-smelting, being blown into fine shreds by a blast, to fill walls and floors with a fire-proof and rat-proof padding, and for other unique services. *Réamur's porcelain* is an opaque and porcelain-like glass, which has been 'devitrified' by great heat and gradual cooling, becoming marvelously tough. *Soluble glass* is a highly alkaline solution of minerals composing glass, which is applied to textures in theatres and elsewhere to render them fire-proof. Fire touching them melts the invisible minerals into a glaze which excludes air and prevents combustion. M. de la Bastie introduced into Europe transmuted glass, which is tougher than cast iron. *Malleable glass* is one of the legends descending from the ancients which may be some day verified.

Among the authorities on glass are: For the history of the art, Gaudy, *Romance of Glass Making* (London, 1898); for the scientific side, Powell, Chance, and Harris, *The Principles of Glass Making* (London, 1883); the chapter on 'Glass,' by Linton, in *The Mineral Industry for 1899* (New York, 1900), and Biser, *Elements of Glass and Glass Making* (1900); and Austin, report on glass in *Twelfth Census of the United States* (Washington, 1902).

GLASS, SOLUBLE. See WATER GLASS.

GLASSBRENNER, gläs'brén-nēr, ADOLF (1810-76). A German humorous and satirical writer, born in Berlin. From 1831 to 1833 he was editor of the Berlin periodical *Don Quixote*, which in the latter year was suppressed by the Ministry. He first became known through his series, *Berlin wie es ist und—trinkt* (33 parts, 1832-50), which originated the Berlin local type of popular humor, much imitated by others. His best work is the comic epic *Neuer Reinicke Fuchs* (1845; often reprinted). From 1858 until his death he edited the *Berliner Montagspost*.

GLASSCHORD. A musical instrument, with keys like a pianoforte, but with bars of glass instead of strings of wire. It was invented in Paris in 1785 by a German called Beyer. The name glasschord was given to the instrument by Franklin. When the glasschord was completed, it was exhibited publicly in Paris, and performed on by the inventor; but it never was received with favor by the instrument-makers, so that no more were ever made. See HARMONICA.

GLASS-CRAB. A larval form of certain macrurous decapoda (q.v.). They were formerly ranked as a separate group of crustaceans. They are remarkable for the transparency of their bodies, whence their name. They have little resemblance to crabs. The head is represented by a large oval plate, bearing eyes mounted on very long stalks; a second plate, the breadth of which much exceeds its length, represents the thorax, and bears the feet, most of which are long, and some of them, as in other crustaceans, bifid, with one branch much longer than the other. The abdomen is small. These creatures have no special organs of respiration, but the blood is aerated through the general surface of the body. They are found in tropical and subtropical seas; and so transparent are they that when floating on the surface of the water they would not be perceived but for the beautiful blue of their eyes.

GLASSE, gläs, HANNAH. The author of *The Art of Cookery* (1747). The only hints of her personality are the mention of a "Mrs. Glasse, Cary Street," among the subscribers to the first edition, which was published anonymously, and the advertisement in the fourth edition (1770) of *Hannah Glasse, Habit Maker to H. R. H. the Princess of Wales, in Tavistock Street, Covent Garden. The Art of Cookery Made Plain and Easy* is ascribed to Dr. John Hill in Boswell's *Johnson*, but this is improbable. Mrs. Glasse wrote *The Compleat Confectioner* (c. 1770), and *The Servants' Directory, or Housekeeper's Companion* (1770). The famous direction, "First catch your hare," although often referred to *The Art of Cookery*, is not to be found there.

GLASSEYE. The wall-eyed pike (*Stizostedion vitreum*). See PIKE-PERCH.

GLASSITES, gläs'its. See SANDEMANIANS.

GLASSON, gläs'son', ERNEST DÉSIRÉ (1839—). A French jurist, born at Noyon. He was educated at Strassburg, was admitted to the bar, and, after teaching a year at Strassburg, went to Nancy as a member of the new legal faculty. In 1899 he was appointed dean of the faculty of law at the University of Paris. He did much to popularize the study of comparative legislation. His works include: *Du consentement des époux au mariage* (1866); *Eléments du droit français dans ses rapports avec le droit naturel et l'économie politique* (2d ed. 1884); *Le mariage civil et le divorce* (1879); *Histoire du droit et des institutions de l'Angleterre* (1881-83); *Le code civil et la question ouvrière* (1886); and *Histoire du droit et des institutions de la France* (1887-96). Glasson acted as editor of the legal department of *La Grande Encyclopédie*, and contributed to many technical journals.

GLASS PAPER, or CLOTH. An abrasive surface made by powdering glass more or less finely, and sprinkling it over paper or calico still wet with a coat of thin glue; the powdered glass adheres as it dries. Glass paper is very extensively employed as a means for polishing metal and woodwork, and is sold in sheets.

GLASS SNAIL. A very small, almost transparent snail of the genus *Vitrina*, species of which are common in the northerly United States. These glassy snails are remarkably hardy in reference to cold, and consequently are found higher up on mountains than most snails are able to live.

GLASS SNAKE. See BLINDWORM.

GLASTONBURY. A market-town and municipal borough in Somerset, England, situated on a peninsula formed by a winding of the river Brue, 25 miles southwest of Bath (Map: England, D 5). It has some manufactures, an export trade, and in the vicinity are chalybeate springs which formerly attracted health-seekers. Population, in 1891, 4119; in 1901, 4016. It is important as the cradle of English tradition and history, and the great unbroken link between modern, mediæval, and early British Christianity. Its chief material interest lies in the ruins of its splendid abbey founded in the sixth century. Of this magnificent pile, which covered sixty acres, the only remains are parts of the abbey church, with the roofless chapels of Saint Joseph and of Saint Mary, and the Abbot's Kitchen, a square, massive, and strongly buttressed structure, all especially important as specimens of early and transitional architecture. A causeway across Sedgemoor and many of the houses of the town are built from the materials of the abbey, which became a common and prolific quarry for the neighborhood. Other buildings and places of interest are the George Inn, a pilgrims' hostelry of the fifteenth century; the two parish churches, the Tribunal, the Abbot's Barn, Wearyall Hill, and the Tor, 500 feet high, from which a fine view is obtained. Two miles to the southwest lies Sharpsham Park, where Fielding the novelist was born.

Glastonbury has prehistoric remains of a marsh village, five acres in extent. At Glastonbury is said to have been situated the first English Christian church, a little wattled building erected by Joseph of Arimathea, the leader of the twelve apostles sent by Saint Philip to Christianize Britain. Tradition states that Joseph established himself here owing to his pilgrim's staff, which he planted on Wearyall Hill while he rested, taking root. From it sprang the celebrated 'Glastonbury thorn,' the *Cratægus precor*, which, according to popular superstition, blossomed every Christmas Day. It was fanatically destroyed by a Puritan during the Cromwellian period, but grafts exist which maintain the traditional blossoming. The site of the original tree is marked by a stone, inscribed I'A, Anno D. XXXI. Joseph was succeeded by two missionaries who established a fraternity of anchorites, which the famous Saint Patrick organized under monastic rule three centuries later. Although joined to the land by Saint Michael's Tor, the peninsula was first known by the Celtic name *Ynyswitrin*, 'isle of the glassy water,' and later as *Ynys yr Avalon*, 'isle of Avalon,' or 'of Apples.' It is the Avalonian burial-place of King Arthur and Queen Guinevere. The modern name is a corruption of Glæstingaburgh. A legend relates that in the long quest of a lost sow a Glæsting was led to an apple-tree by the old church, where, pleased with the place, he and his family settled; hence Glæstingaburgh—city of the Glæstings.

Reliable history relates that about 546 David Meneva built a new church near the old wicker chapel. Paulinus of York in 630 sought to preserve the old chapel as a sacred relic by incasing it in boards covered with lead. In the eighth century the Saxon King Ine built and endowed a Benedictine monastery, which suffered

during the Danish invasions, but was restored and added to by another famous prelate, Saint Dunstan, a native of Glastonbury and a pupil of the institution, who became abbot in 946. It was the sepulchre of Kings Edmund, Edgar, and Edmund Ironside. During the tumultuous period of the Norman Conquest Glastonbury remained unmolested. From 1120 to 1172 the old buildings were replaced by much finer ones, which were scarcely completed when they, with the wicker church, were destroyed by fire on May 25, 1184. Henry II. immediately ordered a larger abbey and church of superb proportions and architecture to be built, which were finished about a century after his death. The length of the church was 525 feet. During the foundation excavations, the supposed grave of King Arthur was discovered. In 1539, on the refusal of Abbot Whiting to surrender Glastonbury and its treasures, Henry VIII. suppressed and dismantled the abbey, and hanged the abbot on the Tor. His body was quartered, and his head fixed on the abbey gate. He was canonized by the Roman Catholic Church in 1896. The famous old abbey clock is preserved in Wells Cathedral. Consult: Hearne, *History and Antiquities of Glastonbury* (Oxford, 1722); Wakefield, *The Avalonian Guide* (Glastonbury, 1821); Willis, *Architectural History of Glastonbury Abbey* (London, 1866); Freeman, *English Towns and Districts* (London, 1883); Gasquet, "The Last Abbot of Glastonbury," in *Henry VIII. and the English Monasteries* (London, 1888-90).

GLASTONBURY THORN. A hawthorn tree at Glastonbury, England, said to have sprung from the staff of Joseph of Arimathea, which he planted in the ground on his visit to the spot. According to the legend, it blossomed on Christmas Day.

GLATIGNY, glá'té'nyé', ALFRED, or ALBERT (1839-73). A French poet, born at Lillebonne (Seine Inférieure). While still very young he wrote his first play, and at seventeen joined a troupe of strolling actors, and wandered with them over Northern France and into Belgium. He wrote constantly, with all the faults and failings of an improvisator. He was one of the 'Parnassiens,' "the last." Saintsbury calls him, "of the vagabond school of Villon." His works include: *Les vignes folles* (1857); *Les flèches d'or* (1864); *Gilles et pasquins* (1872); *L'illustre Brizacier* (1873); and many songs and epigrams.

GLATZ, gláts (Bohemian *Kladsko*). The capital of a circle and a fortified town in the Prussian Province of Silesia, situated on the Neisse, among the Sudetic Mountains, 58 miles by rail southwest of Breslau (Map: Prussia, G 3). It is commanded by an old citadel, and the right bank of the stream is protected by a strong fort, both fortifications dating from 1743. The old ramparts have been demolished, and fine promenades and streets laid out on their sites. Glatz has a new Rathaus, a municipal theatre, and a gymnasium, originally a Jesuit college founded in 1597. The manufactures consist principally of iron products, machinery, furniture, spirits, cigars, shoes, and brick. Glatz is believed to have been founded by the Bohemians in the tenth century. Population, in 1890, 13,501; in 1900, 14,926.

GLAUBER, glou'bér, JAN, called POLYDOR (1642-1726). A Dutch landscape painter and etcher, born at Utrecht, pupil of Berchem at Haarlem, then in Paris (1671) of Picard, and for two years at Lyons of A. van der Kabel. Having gone to Rome, he was much influenced there by Gaspard Poussin, worked afterwards in Padua and Venice, and in 1680 went to Hamburg, residing there and in Copenhagen until 1685, when he settled in Amsterdam, living in the house of Gerard de Lairese, who painted the figures in his landscapes. These are kindred in conception and coloring to those of G. Poussin, often surpassing his model, and are to be found in the Louvre and all the principal galleries of Europe. Of his etchings, the best are a series of twelve plates, two after Poussin, and six others published under the title "La grande Chartreuse."

GLAUBER, JOHANN RUDOLF (1604-68). A German chemist and physician, born at Karlstadt, in Franconia. No details regarding his life are known except that he resided for a long time at Salzburg, then at Kitzingen, then at Frankfort-on-the-Main, then at Cologne, from whence he removed to Amsterdam in 1648. A complete edition of his works, in seven volumes, appeared at Amsterdam in 1661. An English translation by Parke, in one large folio volume, was published in London in 1689. Glauber improved many industrial processes, and discovered the medicinal properties of numerous substances. His name at the present day is chiefly known for his discovery of sulphate of soda, which he termed *sal mirabile*, and regarded as a universal medicine and a cure for all diseases. See CHEMISTRY.

GLAUBER'S SALT, or SODIUM SULPHATE, Na_2SO_4 . When crystallized with water, it has the formula $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$. It is found native as *mirabilite* or *sal mirabile* at various places in Austria, Italy, and Spain, and in the United States in large quantities at Great Salt Lake, Utah. It is also a constituent of mineral waters, and exists in small quantities in the blood and other animal fluids. It was originally prepared by Glauber in 1658, by decomposing sodium chloride (common salt) with sulphuric acid. Formerly it was a by-product in the manufacture of hydrochloric acid from common salt and sulphuric acid, and in the manufacture of common salt. At present it is obtained mainly as a by-product ('salt cake') in the manufacture of soda-ash. Glauber's salt is a white crystalline compound, with a bitter saline taste. When exposed to the air its crystals effloresce, losing most of their water of crystallization, and becoming a white powder. Its chief use is as a purgative in medicine, and as such it is largely used in veterinary practice; but it is also largely employed in the production of certain kinds of glass, and in fixing lead mordants in dyeing and printing. See SODA.

GLAUCHAU, glou'kou. A manufacturing town in Saxony, Germany, situated on the Mulde, eight miles north-northeast of Zwickau (Map: Germany, E 3). It contains two old churches, dating from the twelfth and the sixteenth century respectively; two castles; and a new Rathaus. Among its numerous educational institutions the most prominent is the school of weaving, with a good collection of old textiles. Glauchau is one of the centres of the German

textile industry, producing principally woolen and half-woolen goods. There are also manufactured machinery, timber, and brick. Glaucho is the birthplace of the famous mineralogist Georg Agricola. Population, in 1890, 23,405; in 1900, 25,677.

GLAUCOMA (Lat., from Gk. *γλαύκωμα*, opacity of the crystalline lens, from *γλαυκός*, *glaukos*, bluish-green; so called from the appearance of the eye in this disease). An important disease of the eye, characterized by increased intraocular tension. In addition to primary and secondary glaucoma, a congenital glaucoma is described. According to the rapidity of onset and the severity of the disease, primary glaucoma is divided into inflammatory or congestive, and non-inflammatory or simple. The inflammatory type may be acute or chronic. The cause of glaucoma is unknown. The disease has been observed chiefly in old persons, particularly in women, and usually involves the eyes successively. Jews seem predisposed to it. Heredity, gouty and rheumatic diatheses, cardiac and arterial disease, and chronic constipation seem to exert an influence. Persons with hyperopia (see SIGHT, DEFECTS OF) are often afflicted with glaucoma; those with myopic eyes, very rarely. Various forms of excitement, eye-strain, improper use of atropine, and other causes of venous congestion of the eyes are mentioned as exciting factors. The essential feature of the disease is the increase of pressure within the eye, the present view being that there is undue retention of fluids within the eye. Acute inflammatory glaucoma may begin with a prodromal stage, in which sight is somewhat obscured by œdema of the cornea, with some dilatation of the pupil and increased tension in the eyeball. A number of these attacks, each followed by increased presbyopia (see SIGHT, DEFECTS OF), are succeeded by the stage of active glaucoma. This is marked by sudden failure of vision, with great pain in the eye, and headache. There is marked increase of tension, cloudiness and insensibility of the cornea; the pupil is oval, fixedly dilated, and often greenish; the iris is dull and changed in color. The conjunctiva is congested, including the space around the cornea. The interior of the eye is cloudy. Recovery takes place with practically a persistence of all these appearances in a slight degree, and from time to time other attacks occur, the eye being left in worse condition after each. Finally the stage of absolute glaucoma is reached: blindness, increase of the changes in appearance noted in the early attacks, increased tension, and in some cases pain at intervals. Degeneration of the eyeball may follow. Cases of unusual severity, resulting in blindness within a few hours, are known as *glaucoma fulminans*. Chronic inflammatory glaucoma differs from the acute only in the mildness of its initial symptoms and the slowness of its course, the final result being the same. *Simple glaucoma* is a very slowly progressing type, with no active symptoms of inflammation, simply the increased tension and gradual failure of vision. *Secondary glaucoma* is an increase of tension, with other symptoms of glaucoma, secondary to other disease of the eye or to injury. *Congenital glaucoma* usually affects both eyes, leading to blindness. In the treatment of glaucoma atropine must never be employed. Eserine

and pilocarpine, locally, may give some relief. Iridectomy, an excision of part of the iris, is the most effectual treatment. Sclerotomy, an incision through the sclera or white of the eye, is sometimes employed in its place.

GLAUCONITE, *gl'kô-nīt* (from Gk. *γλαυκός*, *glaukos*, bluish-green), or GREEN EARTH. An iron potassium hydrous silicate. It is found either amorphous in cavities of rocks, or in a loosely granular condition. In color it is of various shades of green, and is found in Russia, in Belgium, and in various localities in New Jersey and Mississippi in the United States.

GLAUCOPHANE, *gl'kô-phān* (from Gk. *γλαυκός*, *glaukos*, bluish-green + *φαίνειν*, *phainein*, to appear). A mineral belonging to the amphibole group and crystallizing in the monoclinic system. It is a silicate of sodium, aluminum, iron, and magnesium. The mineral has a vitreous to pearly lustre, and is found in various shades of blue. It is a constituent of various crystalline schists, gneisses, and other rocks. It occurs associated with diallage, epidote, mica, garnet, etc., at various points along the Alps in Switzerland, and in Italy; while in the United States it is found on the coast ranges of California. According to Dana, it has been noted as a secondary product due to the alteration of diallage by a process of 'glaucophanization.'

GLAUCUS (Lat., from Gk. *Γλαῦκος*, *Glaukos*). A Lycian prince, who, along with Sarpedon, assisted Priam in the Trojan War. He was the son of Hippolochus, and grandson of Bellerophon, mythical progenitor of the kings of Lycia. When Glaucus and Diomedes met in battle they discovered their houses were joined in hereditary friendship, whereupon they exchanged weapons, Glaucus giving his golden armor for the bronze of Diomedes (*Iliad*, vi.). The incident became proverbial for an unequal exchange. Later writers say that he was afterwards slain by Ajax; but his body was carried back to Lycia, as that of his brother had been.

GLAUCUS. An artist of Chios, said to have invented the art of soldering iron. His most famous work was a silver vase resting on an iron base, curiously decorated and wrought in his new technique, which was dedicated about B.C. 605 by Alyattes II. of Lydia to Apollo at Delphi.

GLAUCUS. Son of Minos, King of Crete, and Pasiphaë. On one occasion when a child, while playing at ball, or, according to another account, chasing a mouse, he fell into a pot of honey and was smothered. His father, after a long and vain search, consulted the oracle and was told that the person who could suggest the aptest comparison for one of his own cows, which had the power of assuming every day three colors, would restore his son alive. Polyidus, the seer of Argos, who likened the animal to the mulberry and the bramble, was ordered by Minos to find the child and restore it to life. The latter injunction Polyidus was unable to perform, and he was therefore sentenced to be entombed alive with the corpse. Seeing in the tomb a serpent bring back to life its dead companion by laying upon it the leaves of a certain herb, Polyidus conceived the idea of treating the dead boy in the same way. The process proved successful. Then Minos ordered the seer to teach the child the art of prophecy. This also Polyidus did, but imme-

diately deprived him again of all remembrance of his instruction. Consult: Höck, *Kreta* (Göttingen, 1829); Roscher, *Nektar und Ambrosia* (Leipzig, 1883); Gädechens, in Roscher's *Lexikon* (Leipzig, 1884 et seq.).

GLAUCUS, PONTIUS. According to the legend, a fisherman of Anthedon. Through the influence of a magic herb he was changed into a sea-god and gifted with unerring prophecy. He is found especially in connection with Nereus and his train, and was worshiped not only at Anthedon, but on many islands and coasts, as at Delos, Naxos, Corinth. He was especially honored by sailors and fishermen, and is often represented in art as wearing a fish-basket on his head. In the legends he appears as prophesying to the Argonauts, and his unrequited loves for Scylla and Ariadne were frequent themes among the later poets. Consult Gädechens, *Glaukos der Meergott* (Göttingen, 1800).

GLAUCUS, POTNIEUS. A son of Sisyphus by Merope, and the father of Bellerophon. According to the legend he was destroyed by his own mares, the most common form of the story being that he was torn to pieces by them. Accounts differ as to the place of his violent death, and also as to the immediate occasion of it. Sometimes it is represented as having happened at Iolous, at the funeral games of Pelias, but usually the scene is laid at Potniæ. He is most frequently represented as having offended Aphrodite by having kept his mares from breeding; but other versions of the myth are that he had fed them on human flesh to make them more spirited, or that they had been suffered to drink at a sacred well at Bæotia, or that they had eaten the herb hippomanes. He was the subject of a lost tragedy of Æschylus. In Corinth this legend is confused with that of Glaucus Pontius (see above), and the same stories are told of both. In fact, it is very probable that the Corinthian Glaucus is only a local variation of the commonly worshiped divinity. Some mythologists (comparing the Greek phrase γλαυκὴ θαλασσα) see in Glaucus the quiet gleaming sea, whose calm surface is destroyed by the violent risings of the waves, the horses of Poseidon.

GLAUCUS. The hero of Bulwer's novel *The Last Days of Pompeii*; a Roman noble, dwelling in Pompeii, and the protector of Nydia, a blind flower-girl, who loves him in secret. He combines luxury, philosophy, and ennui.

GLAZE. See POTTERY.

GLAZE'BROOK, RICHARD TETLEY (1854—). An English physicist. He was born at West Derby, Liverpool, September 18, 1854, and was educated at Liverpool College and Trinity College, Cambridge, where he graduated with honors in 1876 and was made a fellow in the following year. In 1880 he was appointed demonstrator in physics at the Cavendish Laboratory, and ten years later was made assistant director. He was also university lecturer in mathematics at Cambridge, and in 1898 and 1899 was principal of University College, Liverpool. In the latter year he was made director of the National Physical Laboratory, a position he has since held. Among his more important researches are those dealing with the absolute resistance of the British Association unit and the specific resistance of mercury, a dynamical treatment of the theory of

double refraction, a verification of Fresnel's theory of double refraction in a biaxial crystal, and other investigations dealing mainly with optics and electricity. He is the author, with W. N. Shaw, of an excellent *Text-Book of Practical Physics* (1884), and of a *Text-book of Physical Optics* (1882); *Laws and Properties of Matter* (1893); *Clerk-Maxwell and Modern Physics* (1896); and various scientific text-books.

GLAZIER, glä'zhër, WILLARD (1841-1901). An American soldier, author, and explorer. He was born at Fowler, N. Y., was educated at Gouverneur Seminary and at the Albany Normal School. He taught school from 1859 to 1861, when he enlisted in the Second New York Cavalry. In 1863 he was taken prisoner by the Confederates in Virginia and confined in Libby Prison, Richmond, and at Columbia, S. C. His escape to the Union lines was the subject of his first book, *Capture, Prison-Pen and Escape* (1865), of which more than 400,000 copies were sold. He also wrote: *Three Years in the Federal Cavalry* (1870); *Battles for the Union* (1874); *Heroes of Three Years* (1878); *Peculiarities of American Cities* (1873); and *Down the Great River* (1887), the latter being an account of a trip to the sources of the Mississippi River. Consult his life by Owens, *Sword and Pen* (Philadelphia, 1884).

GLAZUNOFF, glä'zŭ-nôff', ALEXANDER (1865—). A Russian composer. He was born at Saint Petersburg, and studied first at the Polytechnic Institute. Conscious of his gift for music, and with the advice of many musical friends and teachers in sympathy with his aims, he determined to devote himself entirely to music. His most important teacher was Rimsky-Korsakoff, who was friend as well as teacher. His first symphony was produced when he was but sixteen years of age, and the second three years later, under the auspices of Liszt at Weimar. Paris accorded him a most enthusiastic reception when in 1889 he visited there and conducted in person his second symphony and many minor compositions. He visited London afterwards, and conducted his fourth symphony at a concert of the London Philharmonic Society. He has been accepted in his own country as a representative Russian composer, and in 1896-97, together with Liadoff and Rimsky-Korsakoff, conducted the national Russian symphony concerts at Saint Petersburg. He belongs to the school of Tchaikovsky in the national sense, and, like him, is occasionally prodigal in brilliant orchestral effects. His concert waltzes for orchestra have been great favorites in America, and have been played frequently by the Thomas orchestra. Besides his orchestral compositions there are many smaller instrumental works to his credit, for he is one of the most prolific composers of the present time.

GLEASON, FREDERICK GRANT (1848-1903). An American composer, born at Middletown, Conn. He was a pupil of Dudley Buck, and in 1869 went to Germany, where he studied in the Leipzig Conservatory, and later in Berlin and London. In 1875 he returned to the United States, becoming church organist in Hartford and New Britain, Conn., and, in 1877, teacher in the Hershey School of Music, Chicago. Mr. Gleason was elected a fellow of the American College of Musicians, president of the Chicago Musical Society,

and president-general of the American Patriotic Musical League. He composed two grand operas, *Otho Visconti* and *Montezuma*, and numerous songs and instrumental pieces.

GLE/BA (Lat., *clod*). A chambered form of fructification found in the puffballs and their allies. See **BASIDIOMYCETES**.

GLEBE (Lat. *gleba*, *clod*). The land possessed as part of an ecclesiastical benefice, or from which the revenues of the benefice arise. The assignment of glebe lands was formerly held to be of such absolute necessity that without them no church could be regularly consecrated. The fee simple of the glebe is held by the law of England to be in *abeyance*; that is to say, it is only "in the remembrance, expectation, and indentment of the law"; but after induction, the freehold of the glebe is in the parson, and he possesses most of the powers of a proprietor, with the exception of the power of alienation. Previous to the Reformation the clergy possessed certain powers of alienation at common law; and if a bishop, with the assent of his chapter, or an abbot, with the assent of his convent, or the like, alienated glebe lands, the deed would not have been void, because the fee simple was in the holder of the benefice for the time being; but by 1 Eliz., c. 19, and 13 Eliz., c. 10, it was provided that all gifts, grants, feoffments, conveyances, or other estates made of glebe lands should be utterly void and of none effect. Neither could the incumbent exchange the lands or any portion of them without the authority of an act of Parliament. This restriction was done away by 55 Geo. III., c. 147, for enabling spiritual persons to exchange parsonage or glebe houses or glebe lands for others of greater value or more conveniently situated for their residence and occupation. By 5 and 6 Vict., c. 54, it is now provided that the commissioners appointed to carry into effect the commutation of tithes shall have power to ascertain and define the boundaries of the glebe lands of any benefice, and also power, with consent of the ordinary and patron, to exchange the glebe lands for other lands within the same or any adjoining parish, or otherwise conveniently situated.

In Scotland, as in England, a glebe forms, as a general rule, a portion of every ecclesiastical benefice of the Established Church, and is thus an addition to the stipend, and sometimes a very important one. As in England, the alienation of glebe lands by the incumbent of the parish has from a very early period been forbidden. (Stat. 1572, c. 48.) Consult Phillimore, *Ecclesiastical Laws of the Church of England* (2d ed., London, 1895).

GLEDE. A bird. See **KITE**.

GLEDITSCH, glä'dich, JOHANN GOTTLIEB (1714-86). A German botanist and writer on forestry. He was born and educated at Leipzig. After lecturing on botany and materia medica at Frankfurt-on-the-Oder for four years, he was appointed professor of botany at Berlin, and director of the Botanical Garden in that city. It was, however, in his capacity as professor of forestry at the Berlin academy devoted to that science that he exercised that permanent influence which induced Linnæus to name the species *Gleditschia* after him. His chief publication is *Systematische Einleitung in die neuere aus ihren*

eigenbümlichen physikalisch-ökonomischen Gründen hergeleitete Forstwissenschaft (1775).

GLEDIT'SCHIA. See **HONEY LOCUST**.

GLEE (AS. *glfo*, mirth, music, leel. *glŷ*, merriment). The English name of a vocal composition for three or more voices, and in one or more movements. The style of music of the glee is peculiar to England, and quite different from the part songs of Germany, being more extended and laying emphasis on variety rather than unity. The first glees were written by Arne and Boyce about the middle of the eighteenth century. The great composer of glees was S. Webbe, who died in London in 1816. Excellent examples of glees are Stevens's "Blow, blow, thou winter wind," and Webbe's "Swiftly from the mountain's brow."

GLEET. See **GONORRHEEA**.

GLEGG, Mrs. The aunt of Maggie Tulliver, in George Eliot's *Mill on the Floss*; a bigoted, carping creature.

GLEICHENBERG, glīk'en-bĕrk. A watering-place of Styria, Austria, 1020 feet above sea-level, in a charming, picturesque valley surrounded on three sides by mountains, about 40 miles southeast of Gratz (Map: Austria, D 3). It is well known for its non-chalybeate saline alkali springs, which are much frequented by sufferers from pulmonary complaints. Large quantities of the water are exported. There are several beautiful châteaux and parks of the Austrian nobility in the vicinity. Resident population, about 800.

GLEICHEN-RUSSWURM, glīk'en-rus'vurm, LUDWIG, Baron von (1836-1901). A German landscape painter, born at Castle Greifenstein, Bavaria, pupil of Max Schmidt and Hagen at the School of Art in Weimar. Given to realistic treatment from the first, his style of painting afterwards approached closely that of the impressionists, as may be seen, respectively, from "An Idyl" (1885), in the National Gallery, Berlin, and an "Evening Landscape" (1892), in the Weimar Museum. Both these galleries have also collections of his water-colors. He was the grandson of Schiller.

GLEIG, glĕg, GEORGE (1753-1840). A Scottish divine, Bishop of Brechin, and primus of the Episcopal Church of Scotland. He was born on a farm at Boghall, Kincardineshire, and was educated at King's College, Aberdeen, where he took honors in mathematics and physical science. He was ordained in the Scotch Episcopal Church in 1773, and took charge of a congregation at Pitmenweem, Fifeshire, removing thence to Stirling in 1787. He became a frequent contributor to the *Monthly Review*, the *Gentleman's Magazine*, and other publications, and wrote extensively for the third edition of the *Encyclopædia Britannica*, of which, after the death of Colin Macfarquhar, the editor, in 1793, he edited the last six volumes. He was thrice elected Bishop of Dunkeld, but through the opposition of Bishop Skinner, the primus of the Scotch Church, whose hostility he had aroused by criticism of one of his sermons in the *Gentleman's Magazine*, his elections were rendered ineffectual. In 1808, however, having acceded to the tests imposed by Bishop Skinner, he was chosen successor to Bishop Strohan in the Bishopric of Brechin, succeeding in 1810. He bent his efforts toward securing a strict ad-

herence to the English liturgy, with the single exception of the communion, and in this he was eminently successful. In 1816 he was elected primus of the Church of Scotland, and set himself to extending the reforms begun in his own episcopate, and cementing the alliance with the English Church. In this he was not altogether successful, owing to his persistent interference in diocesan elections, by which he alienated some of his strongest supporters. He resigned the primacy in 1837. In addition to several volumes of sermons, he published *The Life and Writings of William Robertson* (1812), and *Directions for the Study of Theology* (1837). He edited Stackhouse's *History of the Bible* (1817). Consult Walker, *Life of the Right Reverend John Gleig, Bishop of Brechin* (Edinburgh, 1878).

GLEIG, GEORGE ROBERT (1796-1888). A Scottish writer, born at Stirling, and the son of George Gleig, Bishop of Brechin. In 1812, while a student at Oxford, he joined, as a volunteer, a regiment then on its way to London, and served in the Peninsular campaign. During the American War of 1812-14 he participated in the movement against the city of Washington, and was severely wounded in the battle of Bladensburg. In 1821 he published an account of the *Campaigns of the British Army at Washington and New Orleans*. After the war he entered holy orders, and was presented to the living of Ivy Church, Kent. In 1825 he published *The Subaltern*, a novel founded on his experience in the Peninsular War, written in an entertaining style and showing considerable literary skill. In 1844 he was appointed chaplain-general of the forces, and having devised a scheme for the education of soldiers, was later appointed inspector-general of military schools. Gleig wrote a great variety of biographical, historical, and religious books. The most interesting is his *Life of the Duke of Wellington* (1862). His *Life of Warren Hastings* (1841) served as the text of Macaulay's *Essay on Warren Hastings*.

GLEIM, glīm, JOHANN WILHELM LUDWIG (1719-1803). A German poet whom the glories of Frederick II.'s struggle in the Seven Years' War inspired to write the vigorous and thrilling *Lieder eines preussischen Grenadiers* (1758). Gleim was born at Ermsleben, near Halberstadt, and was the most prominent of the early political song writers of Germany. His other songs, fables, romances, classical and mediæval imitations, are as unimportant as his didactic epic *Halladat* (1774), being at their best feebly pretty and at their worst very dull. He died at Halberstadt. Gleim's *Works* are in 7 vols. (1811-13). For his *Life*, consult Körte (Halberstadt, 1811).

GLEIWITZ, glī'vīts. A town in the southeastern part of the Prussian Province of Silesia, situated on the Klodnitz and the Klodnitz Canal, 100 miles by rail southeast of Breslau (Map: Prussia, H 3). It is a manufacturing place of considerable importance, containing many extensive foundries, machine-works, wire and wire-nail mills, glass-works, paper and saw mills, etc. Gleiwitz dates from the twelfth century. Population, in 1890, 19,667; in 1900, 52,362, mostly Roman Catholics.

GLENARVON. Lady Caroline Lamb's first novel, published anonymously in London in 1816. Its caricature of Byron, with whom the author

had had a short love affair and a quarrel, soon made the book famous. It was reprinted in 1865.

GLENCOE, glēn-kō'. A deep, precipitous valley, in northern Argyllshire, Scotland. It is about eight miles in length, and is divided into an upper and a lower valley. It is famous for the wildness and sublimity of its scenery, and for the massacre of Glencoe. The Highlanders, faithful to the old dynasty, were promised full pardon if on or before December 31, 1691, they submitted to the rule of William III. and Mary. The surrender of Mac Ian, chief of the Macdonalds of Glencoe, from unforeseen causes was delayed till January 6th. His enemies, headed by Sir John Dalrymple, Master of Stair, suppressed the certificate of submission, and took advantage of the technical irregularity to obtain a warrant from the King for their extirpation. Under the guise of friends, 120 men, mostly Campbells and hereditary foes, led by Captain Campbell of Glenlyon, accepted the hospitality of the Macdonalds for twelve days, then treacherously attacked them at five o'clock in the morning of February 13, 1692. Thirty-eight persons, including children and women, were slain. About three hundred men and women escaped in a violent storm, but many perished from cold and hunger in the snow of the mountain gorges. Consult Macaulay, *History of England*.

GLENCOE. A village and the county-seat of McLeod County, Minn., 51 miles west by south of Minneapolis; on the Chicago, Milwaukee and Saint Paul Railroad (Map: Minnesota, D 6). It is surrounded by a farming region, and has grain-elevators, flour-mills, lumber-mills, etc. Stevens Seminary and Saint Joseph's Academy are here. Population, in 1890, 1649; in 1900, 1780.

GLENCOE, OR THE FALL OF THE McDONALDS. A drama by Sir Thomas Talfourd, produced in 1840 by Macready and preferred by him to the author's more famous *Ion* in its dramatic construction.

GLENCORSE, LORD. See INGLIS, JOHN, Lord GLENCORSE.

GLENDALE, BATTLE OF. See FRAZIER'S FARM, BATTLE OF.

GLENDIN'ING, EDWARD and HALBERT. Two brothers, important characters in Scott's *Monastery* and its sequel, *The Abbot*. The latter, the elder, becomes the Knight of Avenel in the second work.

GLEN'DIVE. The county-seat of Dawson County, Mont., 78 miles northeast of Miles City; on the Yellowstone River, and on the Northern Pacific Railroad (Map: Montana, G 2). It has railroad repair shops, and carries on an important trade in live stock and wool. Extensive deposits of lignite are found in the adjacent region. Population, about 1200.

GLEN DOWER, glēn'dōor, OWEN (1359?-1416?). A Welsh chief, claiming descent from Llewellyn, and prominent as an opponent of the English during the reign of Henry IV. At first he was a follower of Henry of Lancaster, who succeeded Richard II. in 1399, but local troubles forced him into opposition. The Welsh were strongly attached to Richard II., and, moved by rumors that Richard was still alive, rose in revolt against Henry (1400). Glendower led this movement, and was at first very successful. The King ordered his subjugation, and granted his

estates to the Earl of Somerset. Though Glendower's forces were inferior in number to those of his adversaries, he was sometimes victorious, chiefly through surprise, ambushes, and the like. Often, however, he was defeated and forced to retire to the hills. In 1402 he drew Lord Grey into an ambush and took him prisoner. A few weeks later Sir Edmund Mortimer, the uncle of the Earl of March, was captured by Glendower, after a battle won by the latter. Treason seems to have been falsely imputed to Mortimer as the cause of his defeat; but Henry IV.'s suspicions and Glendower's kindness soon made the treason sufficiently real, for Mortimer married one of Glendower's daughters and conspired with him against the English King. In July, 1404, Glendower entered into a treaty with Charles VI. of France against the English. Little came of it, for in the following year Glendower sustained severe reverses. For two or three years more his fortunes were somewhat in the ascendant, and then they sank to the ordinary level of the petty warfare of a barbarous mountain chief. On February 24, 1416, Glendower was still alive, but nothing is known about him after that date. His successes show that he had about the highest talents of his class, and he had their faults also. The popular idea of him is to be found in Shakespeare's *King Henry IV.* From the first he has been a kind of mythical hero, and the lapse of centuries does not clear up the exact facts of his history. He was the last champion of Welsh independence which the English kings had been steadily stamping out for nearly a century and a half. Consult Wylie, *History of Henry IV.* (London, 1881-94).

GLENELG'. A shallow river, 280 miles long, rising in the southwestern part of Victoria (Map: Victoria, A 4). After crossing the boundary into South Australia and receiving all the rivers southwest of the Grampian Mountains it enters the Southern Ocean between Cape Northumberland on the west and Cape Bridgewater on the east. In the rainy season it is subject to heavy floods.

GLENGARRY. A beautiful valley or glen in West Inverness-shire, Scotland, about eight miles southwest of Fort Augustus (Map: Scotland, C 2). It takes its name from the Garry River, which takes a winding course through it for some nineteen miles. This valley was the home of the Macdonnells from the beginning of the sixteenth century until the death of the last of the acknowledged chief's family in the early part of the nineteenth century. Scott is said to have taken the last chief of this family, Col. Alexander Ranaldson Macdonell, as his model for Fergus MacIvor in *Waverley*. The Glengarry cap was named from this valley.

GLENROY'. A narrow, rocky glen of Inverness-shire, Scotland, through which flows the Roy. After a course of about 15 miles this stream joins the Spean at Keppoch (Map: Scotland, D 3). The glen is remarkable for three terraced shelves, running round it, everywhere horizontal and parallel to each other, and known as the 'parallel roads of Glenroy.' The highest is about 1150 feet above sea-level. The second is 80 feet lower; the third lies about 855 feet above sea-level, and may be traced round the mountain of the glen into the valley of the Spean. The subject of much scientific study and discussion, they

are now conceded to be ancient water margins, the shore-lines of fresh-water lakes, which gradually washed away the ice barriers of a glacial period.

GLENS FALLS. A village in Warren County, N. Y., 56 miles north of Troy; on the Hudson River and on the Delaware and Hudson Canal Company's Railroad (Map: New York, G 2). It derives its name from the falls in the Hudson, which supply exceptional power for manufacturing; and the island below the falls is associated with Cooper's *Last of the Mohicans*. There are large quarries of black marble and limestone, extensive lime-works, Portland-cement works, a number of saw-mills and planing-mills, and manufactures of paper, shirts, collars, plaster, lath, etc. The village has the Crandall Free Library, a State armory, Saint Mary's and Glens Falls academies, an old ladies' home, the Parks Hospital, McGregor and Crandall parks, and a great iron bridge just below the falls. The government is administered under general laws of 1870, the village having been reincorporated in 1872, by a village president and a board of trustees, which elects most of the subordinate officials. Town meetings are held every two years, and the charter election annually. The village owns and operates its water-works. Glens Falls was settled in 1763 and incorporated in 1837. In 1864 it was almost completely destroyed by fire, and again in 1884 was visited with a similar disaster, which necessitated the rebuilding of the southern part of the village. Population, in 1890, 9509; in 1900, 12,613.

GLENVILLE. A village in Cuyahoga County, Ohio, five miles from Cleveland; on the Lake Shore and Michigan Southern Railroad (Map: Ohio, G 2). It is primarily a residential suburb of Cleveland, and is just east of Gordon Park, a part of that city's public park system. The principal industrial establishment is a chair-factory. Settled in 1804, Glenville was incorporated in 1872. The government is administered under a charter of 1878, which provides for a biennially elected mayor and a village council. Population, in 1900, 5588.

GLENWOOD. A city and the county-seat of Mills County, Iowa, 20 miles south by east of Council Bluffs; on the Chicago, Burlington and Quincy Railroad (Map: Iowa, B 4). It is the seat of the State Institution for Feeble-Minded Children. The city, besides being the centre of important corn and live stock interests, is in a highly productive fruit-growing country, and has an extensive canning factory. The water-works are owned by the municipality. Population, in 1890, 1890; in 1900, 3040.

GLENWOOD SPRINGS. A town and the county-seat of Garfield County, Colo., 123 miles west of Denver; on the Grand River and on the Denver and Rio Grande Railroad (Map: Colorado, D 2). It is in a cattle-raising, coal and iron mining, fruit-growing, and general farming region, and is widely known as a health resort. Among its attractions are numerous hot springs, an open-air swimming-pool which affords bathing in winter as well as in summer, and superb mountain scenery. Population, in 1890, 920; in 1900, 1350.

GLEYSRE, glär, CHARLES (1806-74). A French painter, born at Chevilly in Canton Vaud, Switzerland. At the age of eighteen he

went to Paris and worked under Hersent. Later he studied the works of the masters in Italy and traveled extensively in the Orient, sketching land and people after nature. His first work at the Salon appeared in 1840, but he did not obtain marked success until in 1843 he exhibited "Evening," also called "Lost Illusions," now in the Walters Gallery, Baltimore. Among his other works are the "Departure of the Apostles" (1845); "Pentecost," in Sainte Marguerite, Paris; the "Execution of Major Duval," and the "Battle of Leman," in the Lausanne Museum; "Pentheus Pursued by Mænads," and the "Charmer," in the Basel Museum. Gleyre's genius was refined and sensitive, and his works were executed with conscientious frankness and sincerity. Among his pupils were many men afterwards well known in the world of art. Gleyre died suddenly, May 5, 1874, while visiting the Alsace-Lorraine exhibition at the Palais Bourbon. For his biography, consult: Clement (Paris, 1885); Berthond (Lausanne, 1880); Mantz, in *Gazette des Beaux-Arts* (Paris, 1875); and Cook, *Art and Artists of Our Time*, vol. i. (New York, 1888).

GLID'DON, GEORGE ROBINS (1809-57). An English archaeologist, Egyptologist, and ethnologist, born in Devonshire. When very young he was taken to Egypt by his father, who was a merchant residing at Alexandria and also United States consul. During Gliddon's long residence in Egypt, in the course of which he served for some time as United States vice-consul, he devoted much time to the study of Egyptian antiquities. Later he came to America and lectured on this subject in Boston, New York, and Philadelphia. His lectures did much to attract popular interest to Egyptology and its results. At the time of his death in Panama he was agent for the Honduras interoceanic railway. He wrote: *A Memoir on the Cotton of Egypt* (1841); *An Appeal to the Antiquaries of Europe on the Destruction of the Monuments of Egypt* (1841); *Discourses on Egyptian Archaeology* (1841); *Ancient Egypt* (1850; new edition, 1853); *Types of Mankind*, written in conjunction with Dr. J. C. Nott and containing contributions from Agassiz, Dr. Samuel G. Morton, and others (1854); *Indigenous Races of the Earth*, also written in conjunction with Dr. Nott and containing contributions from Alfred Maury, librarian of the French Institute; Francis Pulszky, the Hungarian ethnologist; and Professor Meigs, of Philadelphia (1857).

GLINKA, glĕŋ'kă, FEODOR NIKOLAYEVITCH (1788-1880). A Russian soldier and man of letters. He was born at Smolensk, in 1788, and was educated for the army. In 1803 he became an officer, and in 1805 fought at Austerlitz. At the close of the campaign he left the service, and devoted himself to study and travel about Russia. Upon the invasion of the French in 1812 he reentered the Russian Army, and remained in active service until the end of the campaign in 1814. When Count Milarodovitch became Military Governor of Saint Petersburg, Glinka was appointed colonel under his command. In 1826, on account of his alleged connection with a political conspiracy, he was banished to Petrozavodsk. After some time he was pardoned, and again took up his residence at Saint Petersburg, and became Councilor of State. He wrote: *Let-*

ters of a Russian Officer in the Campaigns of 1805-06 (1815-16; 2d ed. 1870); a poetical translation of the Psalms, of the Prophets, and of the Book of Job; *Reminiscences of the Year 1812*; and a poem, "Kareliya."

GLINKA, MIKHAIL IVANOVITCH (1804-57). A celebrated Russian composer of the early modern school. He was born at Mikhail, near Smolensk, of aristocratic parents, and consequently received the education of a young noble of the period. His earlier musical teachers were Böhm (violin), Carl Mayer (theory and pianoforte), and later Field; subsequently he spent four years in Italy, ostensibly for his health, but practically completing his musical education. After studying for a little while with Dehn, of Berlin (1834), he was led to attempt composition, the result being the first Russian national opera, *A Life for the Czar* (1836), which received its first performance at Saint Petersburg. While the musical treatment of the opera on the whole is Italian to a degree, it is occasionally very Russian in its coloring, which, together with its purely Russian plot, has earned for its composer the reputation of being the pioneer of the modern Russian school, and the forerunner of the famous national composer Tchaikovsky. His success gained for him the appointment of Imperial chapelmaster and conductor of the opera at Saint Petersburg. The second opera, first presented at Saint Petersburg in 1842, was arranged from a poem of the Russian poet Pushkin, and was entitled *Ruslan and Ludmilla*. In character it is very similar to the first one, and was almost as great a popular success. In 1844 he visited Paris, and gave a series of orchestral concerts. His other works include compositions for the pianoforte, on which instrument he was a brilliant performer, symphonies, orchestral suites, and numerous songs and romances, the latter clearly indicating the influence of Field. He died at Berlin, while on a visit to his old teacher, Dehn. Consult Cui, "La musique en Russie," in *Revue et Gazette Musicale de Paris* (Paris, 1878-79).

GLINKA, SERGEYEVITCH NIKOLAI (1774-1847). A Russian author, brother of Feodor. He was born in the Government of Smolensk, and lived principally at Moscow, where he devoted himself to literary work, and founded the anti-French periodical *Russkoye Vestnik*. His contributions to juvenile literature include *Russian History for Young People* (3d ed. 1824) and *Reading for Children* (1821). Glinka was a very prolific author; he is said to have written more than fifty works. During the last twenty years of his life he was a censor at Moscow.

GLIOMA (Neo-Lat., from Gk. γλία, *glia*, glue). A tumor arising from the delicate connective tissue which holds together the nerve substance, either of the brain or of other parts, and which has a gummy or glutinous consistency. Its usual seat is the brain or orbit. See TUMOR.

GLIS'AN, RODNEY (1827—). An American physician. He was born at Linganore, Md., and was educated at the University of Maryland. As assistant surgeon of the United States Army, he served for eleven years as medical officer (1850-61) in the West, and ultimately settled at Portland, Ore. His publications include the following: *Journal of Army Life* (1874); *Text-Book*

of *Modern Midwifery* (1881); and *Two Years in Europe* (1887).

GLISSON, glis'son. FRANCIS (1597-1677). An English physiologist, born at Rampisham, Dorsetshire, and educated at Cambridge and Oxford. He became professor of physics at the former university in 1636, and retained that position until his death. In 1639 he also received an appointment as lecturer on anatomy in all its branches at the College of Physicians, London, of which he was president from 1667 to 1669. He was one of the founders of the Royal Society, and was distinguished alike as an investigator, lecturer, and author. Especially noteworthy were his investigations on the morbid anatomy of rickets, as treated in his famous work entitled *De Rachitide sive morbo puerili qui vulgo The Rickets dicitur, Tractatus* (1650), frequently reprinted and translated into English. His work on the liver and its diseases, entitled *Anatomia Hepatis* (1654), is also important, the term 'Glisson's capsule,' now a part of medical phraseology, perpetuating the name of its author.

GLISSON, OLIVER S. (1809-90). An American naval officer, born in Ohio. He entered the navy as a midshipman in 1826; commanded the schooner *Reefer* during the Mexican War, and accompanied Commodore Perry on his expedition to Japan in 1853-55. In the Civil War he commanded successively the *Mount Vernon* and the *Mohican*, and in the attacks of December, 1864, and January, 1865, on Fort Fisher (q.v.), commanded the third division of the attacking fleet. He was promoted to be commodore in July, 1866, and to be rear-admiral in June, 1870, and on January 18, 1871, was retired from the service.

GLOAG, glög, PATON JAMES (1823—). A Scottish clergyman. He was born at Perth, and was educated at the academy in that city, and at the universities of Edinburgh and Saint Andrews. In 1848 he was appointed minister at Dunning, and remained there until 1860, when he accepted a call to the ministry of Blantyre. He was minister of Galashiels from 1871 to 1892, when he removed to Edinburgh. Besides several translations from the German of the works of Lechler, Huther, Lünemann, and Meyer, he published the following works: *Assurance of Salvation* (2d ed. 1869); *Ezegetical Studies* (1884); *Introduction to the Johannine Writings* (1891); *Subjects and Modes of Baptism* (1891); *The Life of Saint John* (1892).

GLOBE (from Lat. *globus*, ball). A term used to denote any round or spherical body (see SPHERE), and often used to signify the earth. 'Globes,' or 'the globes,' generally means a pair of artificial globes used as a part of school-room apparatus. These are usually hollow spheres of cardboard, coated with a composition of whiting, glue, and oil, upon which paper bearing certain delineations is laid. On one of the globes—the *celestial*—are represented the stars, placed in positions corresponding to their actual situation in the sky. If the celestial globe is *oriented* (i.e. set in a position) correctly, a line drawn from its centre to any star marked on its surface will, if produced to the sky, pass through the actual star. On the other, or *terrestrial* globe, the distribution of land and water, the divisions and subdivisions of the former, together with a few of the most important places, are laid down in positions corresponding to

those which they actually occupy on the surface of the earth. The usual mode of making such globes is as follows: A ball of wood or iron is used as a matrix, and a layer of damped paper is carefully and closely placed upon this, without paste, and other layers are successively pasted over the first one. Ordinary cardboard is thus produced, but instead of being flat, as usual, it forms a spherical shell. When sufficiently thick, this is cut into two hemispheres, the section being made in the line of the intended equator. The hemispheres are then taken off the matrix and again glued together on an axis, and the whiting composition laid on, the outside of which is smoothed and finished to shape in a lathe. The workman has to lay on this composition evenly enough to balance the globe, in order that it may rest at whatever point it is turned. The smooth surface is now marked with the lines of latitude and longitude, and is covered with the paper on which the required geographical or astronomical delineations are engraved. In order to adapt the plane surface of the paper to the curvature of the sphere, it is printed in pieces, small circles for the Arctic and Antarctic regions, and the rest in lens-shaped gores, varying from 20° to 30° of longitude. Great care is required in laying on these curved pieces, so that their edges shall meet exactly without overlapping. The surface is then colored and strongly varnished, and the globe mounted in its frame and stand.

Globes of india-rubber and gutta-percha have also been made, others of thin paper, to be inflated and suspended in a school-room. Embossed globes show, in exaggerated relief, the elevations and depressions of the earth's surface. Compound globes, including the celestial and terrestrial, have been made with an outer glass sphere for the celestial, and an orrery (q.v.) mechanism to show the varying relative positions of the sun and moon, etc. As school-room apparatus, globes are used for the purpose of illustrating the form and motion of the earth, the position and apparent motion of the fixed stars, and for the mechanical solution of a number of problems in geography and practical astronomy. For this purpose, each globe is suspended in a brass ring of somewhat greater diameter, by means of two pins exactly opposite to each other, these pins forming the extremities of the axis round which it revolves, or the north and south poles. This brass circle is then let into a horizontal ring of wood, supported on a stand. The globes in common use in schools are from one to four feet in diameter, but much larger ones have been constructed. Several so-called mammoth globes of the earth and moon have been made, but they have no real value, either for purposes of instruction or for scientific research.

GLOBE, THE. A famous Elizabethan theatre, where most of the plays of Shakespeare, Jonson, Beaumont, Fletcher, Chapman, Massinger, and Ford were first produced. It was erected in Bankside, by the Burbage brothers, in 1599, and was built chiefly from the material of their earlier theatre in Shoreditch. Its hexagonal outer wall inclosed a circular pit, flanked by three galleries, the pit being open to the sky, while the galleries were roofed with thatch, which caught fire in 1613, during a representation of *Henry VIII.*, and caused the destruction of the building. It was soon rebuilt, but was destroyed in

1644 by the Puritans, and a brewery now occupies its site.

GLOBE AMARANTH. See AMARANTH.

GLOBEFISH. A marine fish of the family Tetraodontidae and order Plectognathi (q.v.), remarkable for its power of inflation. These fishes possess a large, ventral, bladder-like expansion of the œsophagus, which may be filled with water or air so suddenly that the body assumes at once a spherical form. The skin is stretched to its utmost extent, and becomes firm. The scales are mostly reduced to spines imbedded in the skin, and these spines now stand upright, and form an important protective covering. This power of swelling suddenly must be regarded as an adaptation for defense, since the distended fish can hardly be grasped with impunity by the mouth of any predaceous animal. The fishes of this group are chiefly tropical, and some species are as large as a football, or larger, and used as food. Two or three species occur along the eastern coast of the United States, of which one (*Spheroïdes turgidus*) is very abundant, especially along the rocky shores of southern New England and Long Island, where it is known as swelldoodle, puffer, eggfish, and bellows-fish. It is often caught with a hook, and hundreds, usually small, are taken with every haul of a seine. When lifted from the water it immediately inflates its body by means of short, jerking inspirations of air, and if dropped on the ground will bound about like a rubber ball; or if thrown in the water will bob about for some time at the surface, with little control over its movements, and relieving itself with difficulty of its inflation. It forms a very amusing tenant of a salt-water aquarium. A well-known globe-fish of the Nile is the fahaka (*Tetrodon fahaka*). A large edible West Indian species (*Lagocephalus laevigatus*) is better known as 'rabbit-fish.' See Plate of PLECTOGNATH FISHES.

GLOBE-FLOWER (*Trollius*). A genus of plants of the order Ranunculaceæ, with a calyx of yellow sepals and a corolla of small and linear petals. There are several species, natives of the colder parts of the Northern Hemisphere. The common globe-flower, the lucken gowan of the Scotch (*Trollius europæus*), a native of Great Britain, is sometimes cultivated in flower-gardens. The globe-like appearance of the flower suggests the name.

GLOBIGERINA (Neo-Lat., from Lat. *globus*, ball + *gerere*, to carry). A genus of multilocular perforate foraminifera, with minute shells of glassy, calcareous texture and globular form. They are exceedingly abundant in many portions of the ocean bottom, where they form the greater proportion of the 'globigerina ooze.' Specimens referred to the genus Globigerina have been found in the Lower Cambrian rocks of the Province of New Brunswick, Canada. Their next appearance is in Triassic rocks. But they do not attain prominence till Tertiary time, when they became quite as abundant as they are at present. See FORAMINIFERA; OOZE; OCEAN DEPOSITS.

GLOBIN. See GLOBULINS.

GLOBOID (from Lat. *globus*, ball + Gk. *eidōs*, *eidos*, form). A spheroidal mass of a double phosphate of calcium and magnesium found in aleurone-grains. It is supposed to be

a by-product of the formation of the crystalloid in those bodies. See ALEURONE.

GLOBULINS (from *globule*, from Lat. *globulus*, diminutive of *globus*, ball). A name applied in physiological chemistry to a number of proteid substances that are insoluble in distilled water, but dissolve in dilute solutions of common salt or other neutral salts. The following are the best-known members of the group:

(1) **GLOBULIN** proper, or **CRYSTALLIN**, obtained by rubbing together the crystalline lens of the eye with fine sand and a little salt, digesting the mass with water, filtering, and passing carbonic-acid gas through the highly diluted filtrate, the globulin being then precipitated in a practically pure state. The crystalline lens of the eye contains nearly 25 per cent. of this substance.

(2) **VITELLIN**, a substance very similar to, if not identical with, globulin or crystallin. Vitellin is the chief proteid constituent of the yolk of egg, in which it is found associated with lecithin, and from which it may be obtained, in a more or less impure state, as follows: The yolk is treated with ether repeatedly, till no more coloring matter is extracted; the residue is dissolved in a little 10 per cent. common salt solution; on filtering, the vitellin may be precipitated by the addition of a large excess of water. The precipitate may be purified to some extent by again dissolving it in a little common-salt solution, and again precipitating with an excess of water. As thus obtained, vitellin is a white, granular body, insoluble in water, but very soluble in solutions of common salt, and in dilute solutions of sodium carbonate. Much vitellin is found in caviar, and some probably occurs in plants.

(3) **PARAGLOBULIN**, or **SERUM GLOBULIN**, a characteristic constituent of blood-serum and of lymph, may be prepared as follows: When blood-serum is diluted with 10 parts of water, and carbonic-acid gas is rapidly passed through it, a flocculent precipitate is formed, which becomes granular and easily separable by decantation or filtration. It should be washed with water containing carbonic acid, to prevent re-dissolving. A more complete separation from serum may be effected by saturation with sulphate of magnesia. This yields, according to Hammarsten, about 4.6 parts in 100; but the amount varies in different animals. It occurs in smaller quantities in lymph, chyle, serous fluids, etc. Paraglobulin coagulates at about 69° C. (154°-158° F.).

(4) **FIBRINOGEN**, a substance similar to paraglobulin, along with which it is found in blood-plasma. It is also found in hydrocele fluids, in chyle, etc. By the action of the fibrin ferment it is almost entirely converted into fibrin (q.v.). Fibrinogen may be prepared as follows: Magnesium sulphate is added to blood, which is then centrifugalized, and mixed with an equal volume of a concentrated solution of common salt. The precipitate thus obtained is washed with a strong solution of common salt, and is purified by first dissolving in dilute common-salt solution and then precipitating by addition of more salt, fibrinogen being soluble in dilute, but insoluble in concentrated solutions of salt. Fibrinogen coagulates at 55°-56° C. (131°-133° F.).

(5) **MYOSIN**, the chief constituent of dead, rigid muscle, may be prepared as follows: Dead muscle

substance is chopped up and washed with water; it is then digested with a solution of ammonium chloride and let stand for about thirty hours; the solution is then filtered and added slowly to a large quantity of distilled water; finally, the flocculent precipitate of myosin thus obtained is purified by again dissolving in a little ammonium-chloride solution, and again precipitating by addition to a large amount of distilled water. Myosin coagulates at about the same temperature as fibrinogen. If left for a long time in water, myosin is converted into an insoluble proteid substance. Acids transform myosin into syntonin (q.v.). In muscles, myosin is formed from another proteid, called *mysynogen*, by the action of a specific ferment. Myosin is easily digested by pepsin.

(6) **GLOBIN**, an insoluble proteid substance produced by the spontaneous decomposition of hæmoglobin in the air. Globin is but little soluble in solutions of common salt and in alkalies, and even less in dilute acids. This substance is as yet imperfectly known.

GLOBUS HYSTERICUS (Lat., hysterical ball), or BALL IN THE THROAT. See **HYSTERIA**.

GLOCKENSPIEL, glök'en-spël (Ger., bell-play). A musical instrument originally consisting of bells fastened to an iron rod, and rising above one another in the form of a pyramid. The bells were struck by means of a hammer with a metal head. Later the glockenspiel was constructed in the shape of a lyre, within which metal bars, instead of bells, were fastened. The bars yield a fuller tone than the bells. The instrument is now also constructed so that metal bars are arranged within a box. In this form the glockenspiel is used in the modern opera orchestra, and has a range from b' to d'. The music is written an octave lower than it sounds. Wagner employs the glockenspiel in the magic fire scene in *Die Walküre*.



EARLY FORM
OF GLOCKEN-
SPIEL.

GLOCKNER, glök'nër, or **GROSSGLOCKNER**, grös-glök'nër. One of the highest peaks of the Austrian Alps, situated on the boundary between Tyrol, Carinthia, and Upper Austria (Map: Austria, C 3). Its altitude is 12,344 feet.

GLOGAU, glô'gou, or **GROSSGLOGAU**. The capital of a circle and a second-class fortress in the Prussian Province of Silesia, situated on the left bank of the Oder, 60 miles northwest of Breslau (Map: Prussia, G 3). The town is fortified on three sides, and connected by a wooden bridge with a fortified island in the Oder. The more prominent buildings of Glogau are the old castle, the Rathaus, with a high tower, and the post-office. The Protestant gymnasium dates from the beginning of the eighteenth century, and the Catholic from 1626. Glogau has a prominent geographical institute, a municipal theatre, and a number of benevolent institutions. The manufacturing industries are but slightly developed. The chief products are sugar, starch, machinery, pottery. The railway shops are extensive. There is some trade in wine. Population, in 1890, 20,529; in 1900, 22,136. Glogau was

an important and fortified place as early as the beginning of the eleventh century, and became in the thirteenth century the capital of the Principality of Glogau. At the end of the fifteenth century the town, together with the principality, fell into the hands of Bohemia. During the Thirty Years' War Glogau was captured repeatedly by the Swedes and the Imperial troops, and in 1741 it was taken by storm by the Prussians, and strongly fortified.

GLOGAU, GUSTAV (1844-95). A German philosopher. He was born at Laukschken, East Prussia, and was educated at Berlin. In 1882 he was appointed professor at the Polytechnical Institute at Zürich, and in the following year was appointed professor extraordinary at Halle, whence in 1884 he was called to the chair of philosophy at Kiel. In 1895 he entered upon a tour through Greece, where he met his death in an accident. Glogau regards philosophy as a science embodying the results of all achievements, and thus represents it as a natural growth, inseparable from evolution in its widest sense. Besides his principal work, *Abriss der philosophischen Grundwissenschaften* (1880-88), he published: *Ziel und Wesen der humanistischen Bildung* (1881); *Grundriss der Psychologie* (1884); *Die Ideale der Socialdemokratie und die Aufgabe des Zeitalters* (1892); *Die Hauptlehren der Logik und Wissenschaftslehre* (1894); and *Das Vorstadium und die Anfänge der Philosophie*, edited by Siebeck (1896).

GLOGGNITZ, glög'nits. A small town of Lower Austria, situated on the Schwarza, at the northern base of the Semmering Alps, 45 miles south-southwest of Vienna (Map: Austria, E 3) on the Vienna and Triest Railway. The building of the railway from here to Mürzschlag, a distance of 35 miles, was an extraordinary feat of mountain engineering. The line was constructed in 1848-54, at a cost of about \$10,000,000. Gloggnitz has a picturesque castle situated on a hill. Down to 1803 it was a Benedictine abbey, but afterwards became a private residence. To the southwest lies the interesting Castle of Warthenstein. Population, in 1900, 2249.

GLOMERULE, glôm'ër-ül (from Lat. *glomus*, ball of yarn). A flower-cluster (inflorescence) which is merely a cyme (q.v.), in which the flowers are crowded so close together as to form a sort of head, as seen in some species of dogwood. See **INFLORESCENCE**.

GLOMMEN. The largest river of Norway, issuing from Lake Aursundsjø, at the town of Røros, at an altitude of about 2300 feet (Map: Norway, D 6). It flows in a general southwest direction past the fortress of Kongsvinger, emptying into the Skagerrak at Fredrikstad, after a course of 350 miles. Its most important affluent is the Vorma. The Glommen forms a number of lakes and several waterfalls, which greatly detract from its usefulness as a navigable waterway. Boats ascend to the last waterfall, about 10 miles from the mouth of the river, and above this fall the river is navigable for about 20 miles.

GLONONIN, glôn'ô-in. See **NITROGLYCERIN**.

GLO'RIA IN EXCELSIS (Lat., Glory be to God on high). The first words and the title of one of the oldest Christian doxologies, **EASTERN**

in origin, and in use for more than fifteen hundred years. In the English Church and American churches it forms part of the communion office, and is a substitute for the Gloria Patri after the Psalter. See DOXOLOGY.

GLORIA'NA. The "Faerie Queene" in Spenser's famous poem of that name, for whose honor the various combats against vice are undertaken, and who is Prince Arthur's fated bride. She shadows forth Queen Elizabeth in her capacity of sovereign.

GLORIA PATRI (Lat., Glory be to the Father). The minor doxology in the Christian Church. It is used after the selections from the Psalter and at the end of the anthems.

GLORIOUS VIRGIN, or SAINT MARY THE GLORIOUS. An Order of knighthood, founded by Bartholomew of Vicenza in 1233, and approved by Pope Urban IV. in 1262. This institution was ecclesiastical as well as military, and its objects were the protection of widows and orphans, and the furtherance of the peace of Italy by the suppression of the strife between Guelphs and Ghibellines. The badge was a purple cross between stars, and the costume a white surcoat on a russet cloak. The Order of Saint Mary the Glorious, at Rome, was sanctioned by Paul V. in 1618. Its object was to suppress the Barbary corsairs who infested the Mediterranean. To make the Order effective, the Pope gave the knights command of his galleys, and set apart the town and harbor of Civitavecchia for their use.

GLORY (in meteorology). See HALO.

GLOSS (from Lat. *glossa*, gloss, Gk. γλῶσσα, *glōssa*, tongue). A brief note or explanation written upon the margin or between the lines of a manuscript by some reader. In subsequent copyings such glosses often became incorporated as a part of the text. The object was generally to explain some purely verbal difficulty. Words which are commonly the subject of such explanations are reducible to five classes: (1) foreign words; (2) provincialisms or dialectic expressions; (3) obsolete words; (4) technical words; and (5) words used by the author in some abnormal or exceptional signification. From an early period these verbal difficulties were the object of attention, and the writers who devoted themselves to their elucidation were called *glossatores*, and their works *glossaria*. The principal Greek glossatores are Hesychius of Alexandria (fourth century), Photius (q.v.), Zonaras (twelfth century), Suidas (q.v.), and Favorinus, a Benedictine (died 1537). Most of the rabbinical writers did the same work for the Hebrew text of the Old Testament. The chief glossatores of the Latin Vulgate are the celebrated Walafrid Strabo (q.v.), in the ninth century, author of the *Glossa Ordinaria*, and Anselm of Laon, author of the *Glossa Interlinearis*, who continued Walafrid's work in the twelfth century. Their work was the great storehouse of mediæval exegesis. It was printed with the Latin text in an edition of the Vulgate in 1480. In Roman and canon law, the practice of introducing glosses was of early origin and probably was in imitation of the biblical glosses. Among jurists, the gloss was not purely verbal, but had to do with the true interpretation of the law, and in some cases it was held to be of equal authority with the text itself.

From the position which it occupied in the manuscript, being generally written between the lines of the text, it was called *glossa interlinearis*. The gloss of the Roman law is written in very pure Latin, that of the canon law in the Latinity of the mediæval schools. The first collection of glosses to the canon law was made by Johannes Semeca (Teutonicus) in 1212. It accompanied the *Decretum Gratiani* and was printed in connection with it (Lyons, 1584). Other divisions for the *Corpus Juris Canonici* also had glosses, and they are given in the edition mentioned above.

GLOSSITIS (Neo-Lat., from Gk. γλῶσσα, *glōssa*, tongue). A term used in designating inflammatory diseases of the tongue. *Glossitis superficialis simplex* occurs with great frequency in febrile and digestive disorders accompanied by 'coated tongue' or 'strawberry tongue.' Chronic superficial glossitis occurs often in hypochondriacs, especially in women; the tongue burns, is painful, especially during eating or speaking, and is dotted with red spots and white nodules. It may last for years, with intermissions of weeks or months. Treatment with nitrate of silver or lactic acid is palliative. Hairy tongue is a rare glossitis in which, surrounding a smooth, yellow, brown, or black area, the papillæ are smaller and resemble bristles. The treatment consists in scraping and the application of antiseptics. In 'geographical tongue,' bright red plaques appear, slightly elevated and circumscribed by a gray marginal zone. The forms of the maps change frequently. The trouble generally disappears without treatment. Acute papulose glossitis is extremely rare. In acute diffuse glossitis, or abscess of the tongue, the latter becomes enormously swollen, and the chief dangers of the attack are suffocation from swelling of the parts about the hyoid bone, closure thereby of the glottis (see LARYNX), and general infection. The only really effective treatment is to make pretty deep incisions into the inflamed part, keeping in view that the resulting wound is likely to be much less than appears at the time; for the enlargement of the organ has stretched the mucous membrane, and infiltrated all the textures with fluid, while the vessels are also distended with blood. A straight bistoury should be boldly plunged into the upper surface and several incisions made lengthwise sufficiently deep to evacuate the pus. A good deal of blood will usually follow, but if care has been taken not to injure the lingual artery or its branches (see TONGUE), there is no real danger from this cause. In places at a distance from medical advice, this operation might require to be performed by unskilled hands, and with a penknife, or any other cutting instrument at hand. Care should be taken in this case to make the incisions on the upper surface, and not too far from the middle line. Glossitis is also caused by mercury, during mercurial stomatitis; by syphilis; by tuberculosis; by actinomycosis, etc.

GLOS/SOP. An ancient market town in Derbyshire, England, 13 miles east-southeast of Manchester, on a branch of the Manchester, Sheffield and Lancashire Railway (Map: England, E 3). It is situated on rising ground above the deep Dinting Valley, amid picturesque peak scenery. It is the chief seat of the cotton manufacture of Derbyshire, and has woolen and

paper mills, dye-works, print-fields, bleaching-grounds, and iron-foundries. The ancient parish Church of All Saints, the grammar school, mechanics' institute, and the town hall and market house are the principal buildings. Melandra Castle, the site of a Roman camp, is in the neighborhood. Glossop maintains public baths, free library, owns its water-works, and has a modern system of sewage-works and disposal. Population, in 1891, 21,256; in 1901, 22,416.

GLOSSOPTERIS (Neo-Lat., from Gk. γλῶσσα, *glōssa*, tongue + πτερίς, *pteris*, fern). A fossil fern of the family Tæniopteridæ, which is an important index fossil of certain Permian-Triassic beds of India, Australia, South Africa, and South America, known as the Gondwana series. This fern has thick, leathery leaves of linguæ form, with entire margin, median rib, and anastomosing veins. It is sometimes as much as 12 inches in length.

GLOSTER, or **GLOUCESTER**, glōs'tēr, Earl of. The father of Edgar and of the bastard Edmund, in Shakespeare's *King Lear*. He is deceived and betrayed by his illegitimate son, blinded by Cornwall, and guided through the country and saved from springing over Dover Cliff by the heir, whom he had unjustly disowned. His story is suggested by an episode in Sidney's *Arcadia*, entitled, "The Piteful State and Story of the Paphlagonian Unkind King and His Kind Son."

GLOT'TIS. See LABYXN.

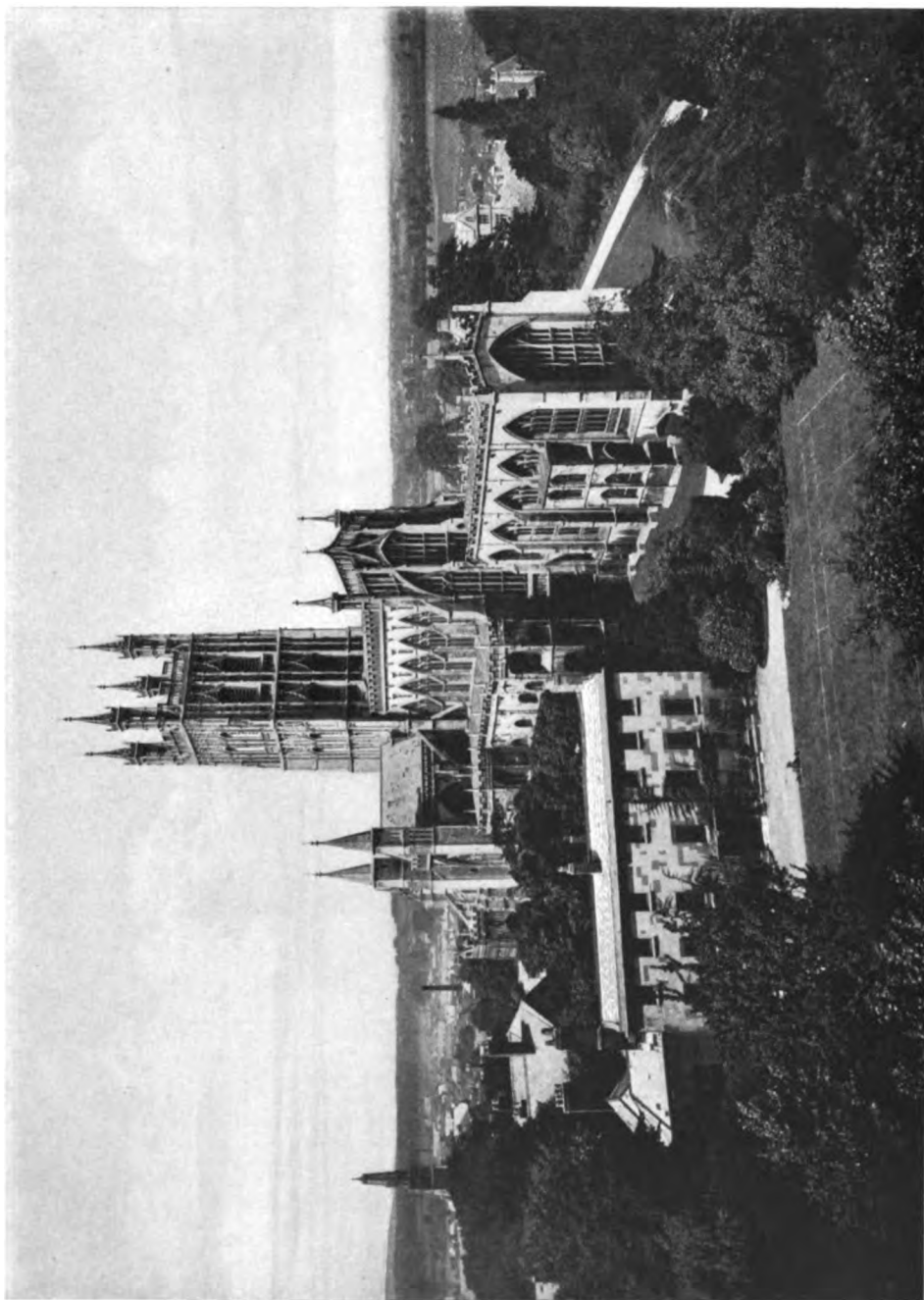
GLOUCESTER, glōs'tēr (AS. *Glōwceaster*, fair city, Lat. *Glevum*, *Claudia*). An inland port, city, and civic county of ancient date, the capital of Gloucestershire, England, on the left bank of the Severn, 33 miles northeast of Bristol (Map: England, D 5).

The city is built on a slight declivity, sloping to the Severn, and is sheltered by the surrounding Coteswold and Malvern Hills. The modern portion is in the neighborhood of the public park and spa, which contains the chalybeate spring, discovered in 1814. The four main streets, named after their orientation, are wide, and built on the ancient Roman ground plan, meeting at right angles in the centre of the town, where the former town hall, the historic Tolsey, stands at the intersection, on the site of the old Roman Capitol. Other buildings and objects of interest are the picturesque deanery, formerly the old priory lodge; the New Inn, a pilgrim's hostelry, built in 1540; the episcopal palace; the new guildhall; and many quaintly gabled timbered houses. A cross marks the spot where Bishop Hooper was burned. The principal building in Gloucester is the cathedral, restored since 1853, the foundation of which dates from the eleventh century. Formerly a Benedictine abbey, skillful alterations and additions evolved from the Norman body a fine building of Perpendicular aspect, which, in 1541, after the suppression of monasteries, was converted into a cathedral by Henry VIII. The chief external ornament is the stately central tower, 225 feet high, with its beautiful tracery and pinnacles. It contains the 'Great Peter' bell, weighing over three tons. Gloucester has three endowed ancient schools, in addition to several modern schools. It has an important municipal record: it received special charters from several monarchs, and Richard III. made it a county. It is governed by a mayor, nine

aldermen, and twenty-seven burgesses. It owns its markets, water-works, cemetery, public baths, technical schools, public library, electric-lighting supply, and dust-destroyer works. It has manufactures of railway engines and wagons, agricultural implements, and cutlery. There are boat and ship building yards, foundries, flour and saw mills, and chemical, rope, match, marble, and slate works. Bell-founding and cloth and pin manufactures were once important industries which no longer exist. A ship canal 17 miles long, communicating with the estuary of the Severn below Sharpness Point, gives access to the spacious docks. The famous bore or tidal wave of the Severn attains its greatest height just before reaching Gloucester. Considerable commerce is carried on with the Baltic and other foreign ports; corn, timber, wines, and spirits are imported; iron and coal, bricks, pottery, salt, malt, and agricultural products are exported. Gloucester is the seat of an American consular agent.

Gloucester was an important Saxon town, styled by Bede 'one of the noblest cities in the land.' It suffered greatly during the period of the Danish incursions. It was a favorite residence of the Norman kings, and was the seat of eight parliaments. Gloucester afforded a refuge and support to Queen Matilda in her contest with Stephen, and Henry III., who 'loved Gloucester better than London,' was crowned in the abbey. In 1643 Gloucester successfully resisted the royal army under Charles I. until relieved by Essex, and at the Restoration its fortifications were dismantled for this 'malignity.' Robert of Gloucester, the metrical historian, Whitefield, and Wheatstone are among Gloucester's celebrities. Consult Masse, *The Cathedral Church of Gloucester* (London, 1898).

GLOUCESTER. A city and port of entry in Essex County, Mass., including the villages of Annisquam, Bay View, East Gloucester, Freshwater Cove, Lanesville, Magnolia, Riverdale, and West Gloucester, 31 miles northeast of Boston; on Massachusetts Bay, near Cape Ann, and on the Boston and Maine Railroad (Map: Massachusetts, F 2). It is a popular resort for summer residents, artists, and tourists, and has the Gilbert Hospital, Gilbert Home, Huntress Home, Magnolia, public, and Sawyer free libraries, and Stage Fort and Marine parks. The city is the seat of the largest fishery interests in the United States, over 5000 men being engaged in the cod and mackerel fisheries. There is a large, accessible, and safe harbor, and salt, coal, and lumber are extensively imported. Besides the fisheries and the quarrying of granite, the principal industries are ship-building, drop-forging, brass-founding, and the manufacture of fish glue, anchors, machinery, oil clothing, nets and twine, sails, cigars, and shoes. In 1623 a company from Dorchester, England, settled at Gloucester, but three years later removed to Naumkeag (Salem). The permanent settlement dates from about 1633, and a town charter was granted in 1642. It was not until the beginning of the eighteenth century that Gloucester became especially prominent for its fisheries and its ship-building industries. Many privateers were sent out during the Revolution and the War of 1812, and the town was unsuccessfully attacked by the English in 1775. A number of disastrous shipwrecks have occurred



GLOUCESTER CATHEDRAL

in the immediate vicinity, and near by is the large sunken rock called Norman's Woe, rendered famous by Longfellow's "The Wreck of the Hesperus." Gloucester was incorporated as a city in 1873, the charter of that year still being in operation. The government is administered by a mayor, elected annually, and a bicameral council. The city owns and operates its water-works. Population, in 1890, 24,651; in 1900, 26,121.

GLOUCESTER, DUKES AND EARLS OF. ROBERT, first Earl of Gloucester (?-1147), was a natural son of King Henry I., and as the champion of the cause of his sister Matilda, won the famous battle of Lincoln over Stephen of Blois.—**RICHARD DE CLARE** (1222-62), seventh Earl, was active on the side of the barons under Henry III., but later quarreled with Simon de Montfort.—**GILBERT**, eighth Earl, surnamed the 'Red' (1243-95), was one of the principal leaders of the barons in their conflict with Henry III., but afterwards joined the royal cause, and was Regent during the absence of Edward I.—**GILBERT**, ninth Earl (?-1314), a son of the preceding and of the daughter of Edward I., was leader of the advance guard at the battle of Bannockburn, in which he fell. The line soon afterwards became extinct, but was renewed in **THOMAS OF WOODSTOCK**, Earl of Buckingham (1355-97), the youngest son of Edward III., who was made Duke of Gloucester by his uncle, Richard II., in 1385, and who later acquired an extraordinary political influence, and dominated the affairs of England for several years. Among the later conspicuous representatives of the title were **HUMPHREY**, Duke of Gloucester, the youngest son of Henry IV. (1391-1447), who was Protector during the minority of Henry VI.; **RICHARD**, brother of King Edward IV., and King of England as Richard III.; **WILLIAM HENRY** (1734-1805), a brother of George III., and **WILLIAM FREDERICK** (1776-1854), a son of the preceding.

GLOUCESTER CITY. A city in Camden County, N. J., one mile south of Camden; on the Delaware River, opposite Philadelphia, with which it is connected by ferry, and on the Atlantic City and the West Jersey and Seashore railroads (Map: New Jersey, B 4). It has manufactures of incandescent gas-burners, calico prints, gingham, woolen yarns, boats, and drills, etc. Settled in 1677, Gloucester City was incorporated in 1868, and is governed under the charter of that date, which provides for a mayor, elected every two years, and a unicameral council. The city owns and operates its water-works. Population, in 1890, 6564; in 1900, 6840.

GLOUCESTERSHIRE. A southwest county of England, bounded by Worcester and Warwickshire on the north, Oxford on the east, Wiltshire and Somerset on the south, and Monmouth and Hereford on the west (Map: England, D 5). Area, 1243 square miles. Gloucestershire is famous as a dairy county, and raises large numbers of cattle. From the orchards of Gloucestershire large quantities of cider are obtained. The Forest of Dean has some iron deposits. The manufactures are numerous and important. The county contains the Parliamentary boroughs of Cheltenham and Gloucester, and part of the Parliamentary borough of Bristol. Capital, Gloucester. Population, in 1891, 599,950; in 1901, 634,700.

GLOUVET, glōv'vâ', JULES DE. See **QUESNAY DE BEAUREPAIRE**, JULES.

GLOVE (AS. *glōf*; perhaps connected with Goth. *lōfa*, Icel. *lōfi*, Eng. *loof*, palm of the hand). A covering for the hand having a separate sheath for each finger, as distinguished from a mitten, in which there is a separate compartment for the thumb only. The glove is a very ancient article of dress. It has been found in the relics of the cave-dwellers, made of leather and sewn with leather thread. Gloves were worn by the ancient Greeks, but chiefly as a protection for the hands in doing heavy work, rather than as an ornamental part of the dress. By the Romans they were worn as ornaments, and were considered a sign of rank. While something in the form of a protection for the hands from cold must always have been needed by northern nations, gloves did not become an important article of dress until after the Norman Conquest. It is thought that the custom of carrying a pet falcon upon the wrist led to their general use. During the eighth and ninth centuries they were worn chiefly by persons of noble birth. Hence they were considered a sign of rank and were taken off, as a token of respect, before a superior or in churches. They were worn in the hat as favors and cast down as a challenge. By the sixteenth century gloves were worn by all classes, and then, as now, were made of silk, worsted, and leather. Those worn by the wealthy were most elaborately ornamented with embroidery and lace. As early as 1190 a guild of glove-makers was formed in France, which took upon itself the task of maintaining honest workmanship among glove-makers, and in introducing constant improvements in methods of manufacture. In Scotland the gloves of Perth were incorporated in 1165. Nearly five centuries later a company of glovers was organized in London, and that city has been an important centre of glove manufacture ever since. At one time glove-making was an important industry in Ireland, and the famous 'Limerick' glove was widely esteemed for its exquisite texture and workmanship. For many centuries France has excelled in the number and quality of gloves manufactured in some of her cities.

GLOVE MANUFACTURING IN THE UNITED STATES. The manufacture of leather gloves in the United States is said to date back to the days of Sir William Johnson in New York State. In 1760 he induced several families of glove-makers from Scotland to settle on his grants, who brought over with them their glove patterns, and the necessary needles and thread for glove-making. Gloves continued to be made in this locality and gradually the demand for them spread until by 1825 they had found a market in Albany and Boston. These early gloves, as compared with modern productions, were crude and clumsy. They were cut with shears from pasteboard patterns, the cutting being usually done by men and the sewing by women. Later, dies were introduced for cutting and were a great improvement. The invention of the sewing-machine in 1852 marked the beginning of a new era in glove manufacture, and soon all hand work was superseded. Steam-power for running the sewing-machines was introduced in 1875. From the start glove-making has been, to a large extent, a household industry, and it still gives employment to a large number of home workers. The cutting

and the stitching on the backs are done at the factories before the gloves are sent out.

GLOVE-MAKING PROCESSES. The term 'kid' is a mere technicality, as the quantity of leather bearing this name yearly consumed is largely in excess of what could be supplied from the skins of all the young goats that are annually slaughtered. Gloves are largely made from lamb-skin. The finest gloves, however, are made from real kid, derived chiefly from Germany, Austria, Sweden, Brazil, Madagascar, and, lately, from France and Bavaria. The younger the kid, the thinner, finer, and softer the glove. Lamb-skin is tougher and harder to work than kid-skin, but it is said that none but an expert can tell the difference in their appearance. The so-called dog-skin, buckskin, and doeskin gloves are made chiefly from sheepskin; some of the thickest kinds of leather gloves are made from calfskin. *Suede* gloves are those in which the inside of the skin is used as the outside of the glove, the name being derived from the Swedish manner of making up gloves. *Glacé* gloves are made with the outside of the leather retained as the outside of the glove.

The leather, in all cases, undergoes a much lighter dressing than when used for boots and shoes. The skin having been freed from hair and cleaned, it is prepared for use by one of the three processes of dressing—tanning, tawing, or shamoying—described under **LEATHER**. For light dress gloves the skins are usually tawed. The leather is next broken or 'staked' to render it pliable and even in texture. It is then colored, by painting lightly on the outside, two or three coats, with a brush, so that the inside will not be affected by the coloring. White gloves are simply undyed gloves. When the dye is thoroughly dried, the superfluous color is removed and the surface rubbed with a size. The gloves are now 'doled' on a marble slab, to remove the dirt and irregularities. After the leather has been properly prepared the gloves are cut out by means of dies. The die cuts out all the parts, including the gussets. A single glove consists of from 16 to 19 pieces. The large skins are used for mousquetaire gloves, but one pair of which can be made from a single skin, though ordinarily two pairs of ordinary gloves can be made from one skin. The scraps that are left, unless the skin was tanned, are used for glue. The first and fourth fingers are completed by gussets or strips sewed only on the inner side, but the second and third fingers require gussets on both sides to complete the finger. Besides these, small pieces of a diamond shape are sewed in at the base of the fingers, toward the palm of the hand. The stitching of the parts together, and also the ornamental stitching on the back of the hand, is done by specially made sewing-machines. The putting on of the thumb-piece requires special skill and management, and badly made gloves commonly give way at this point.

In the American glove-factories there are two classes of cutters, the block and the table cutters, the former of whom are engaged chiefly on the cheaper grades of gloves. The block cutter simply cuts out the glove with a die and hammer, from a skin which is laid on a block of wood. The table cutter first dampens his skin, stretches it to the fullest possible extent, and cuts off the length of a glove. He then stretches it again and cuts it to width, after which the fingers

are cut to shape with a die. A table-cut glove is more elastic and hence fits better than one cut on the block. The table cutters employed in America are mostly foreigners from the glove-manufacturing centres of Europe, and many of them come from families which for centuries have been engaged in the glove-making industry. To be a good cutter requires not only great experience, but natural dexterity and rare judgment in selecting leather so as to cut out the greatest possible number of gloves and yet avoid flaws.

GLOVES NOT MADE FROM LEATHER. The manufacture of woven and knit gloves is an entirely separate branch of the trade. Sometimes the material is first woven and then cut and made up similarly to the leather gloves, or they may be knit into shape by special knitting-machines.

STATISTICS. The centre of the glove industry in the United States is still in Fulton County, N. Y., in the vicinity where Sir William Johnson planted his first colony of glove-makers. Of the 381 glove-factories in the United States, 243 are in that county. The remaining establishments are scattered over the entire country. These 381 establishments represent a combined capital of \$9,004,427, and they turn out an annual product valued at \$16,721,234. This business has shown a steady growth since 1850, when the first census report of the industry was published. At that time there were already 110 glove-factories in the country, with a capital of \$181,200 and an annual product of \$708,184. Of the 2,895,661 dozen pairs manufactured in 1900, all but 323,826 dozen pairs were men's gloves, as the finer grades of women's gloves are still chiefly produced in Europe.

Consult: Hunt, "Leather Gloves and Mittens," in vol. ix., *Manufactures*, part iii., *Twelfth Census of the United States* (Washington, 1902); Beck, *Gloves, Their Annals and Associations* (London, 1883); Frothingham, *History of Fulton County, N. Y.* (Syracuse, 1892).

GLOVE, THE. A story originally told (about 1550) by Pierre Ronsard, and later variously adapted by Schiller, Leigh Hunt, and Browning. It tells of a lady who tosses her glove into a lion's den and commands her lover to fetch it back. He springs down, and, returning unharmed, hurls it in her face in scorn at her capricious cruelty.

GLOVER, glŭv'ər, CATHERINE. The heroine of Scott's *Fair Maid of Perth*, whose appellation among her neighbors suggests the title of the story.

GLOVER, JOHN (1732-97). An American soldier, prominent in the Revolutionary War, born in Salem, Mass. He removed to Marblehead when very young, was a shoemaker for a time, and afterwards engaged in the fishing business. In February, 1773, he was chosen colonel of a militia regiment which upon the outbreak of the Revolution became a part of the Continental Army, as the Fourteenth Regiment, better known as the 'Marine Regiment.' On October 4, 1775, he was placed in charge, with Stephen Moylan, of the equipment and manning of armed vessels and cruisers designed for service against the British, and until July, 1776, was stationed at Beverly, Mass. He then was ordered to New York, and on the night of August 28th-29th, after the battle of Long Island, conducted the transfer of the American army from Long Island to New York.

He was placed in command of General Clinton's brigade on September 4th, took part in the battle of White Plains, and on December 25th manned the boats in which Washington and his army effected the passage of the Delaware before the attack upon Trenton. On February 21, 1777, he was appointed brigadier-general by the Continental Congress, and afterwards took an active part in the campaign against Burgoyne; was placed in charge of the British prisoners on their march from Saratoga to Cambridge; took part in General Sullivan's Rhode Island expedition in July and August, 1778; was a member of the court which tried Major André, and was officer of the day when André was executed; and in July, 1782, was retired on half pay. Subsequently until his death he lived at Marblehead, and in 1788 was a member of the Massachusetts convention which ratified the Federal Constitution. His orderly books and a letter-book containing his Revolutionary correspondence are in the possession of the Essex Institute at Salem, Mass. Consult Upham, *A Memoir of General John Glover of Marblehead* (Salem, 1863).

GLOVER, JOHN (1767-1849). An English landscape painter, born in Leicestershire. He was self-taught in art, having been master of the Appleby Free School from 1786 to 1794. He went to London in 1805, and joined the Water-Color Society, of which he became president in 1815. He received a gold medal at the Paris Exhibition in 1814, and in 1823 he took a prominent part in the foundation of the Society of British Artists. He went to Australia in 1831, and sent to England his sketches of native scenery, until his death in Tasmania. He was an artist of some skill and originality, especially skillful in aerial perspective, but his work became mannered. He also painted in oils, but not with equal success. Among his water-colors are views of "Tivoli," "Windsor Castle," and a "River Scene," in the South Kensington Museum. One of his best oil paintings is a "Landscape with Cattle," in the British Museum.

GLOVER, Mrs. JULIA BETTERTON (1779-1850). An English actress, born at Newry. The daughter of an actor, she began to play juvenile parts about 1789. In 1795 she made her formal debut as Marianne, in Reynolds's *Dramatist*. Her repertoire included Lydia Languish, Widow Green in *The Love Chase*, and the Queen in *Richard III*. Her last appearance on the stage was as Mrs. Malaprop, at Drury Lane only a few days before her death, July 16, 1850. Remarkable for her memory, she was during her middle life considered the best comic actress of the time, and in later years was styled the 'Mother of the Stage.' Consult the memoir by Mrs. Wilson in *Our Actresses* (vol. ii., London, 1844); and Cook, *Hours with the Players* (London, 1881).

GLOVER, RICHARD (1712-85). An English poet. He was the son of a London merchant, and after attending school at Cheam, in Surrey, he entered his father's business. In 1762-68 he sat in Parliament for Weymouth. Though he never attended either university, he acquired, it is said, a good knowledge of Greek. At least, most of his poems are founded on Greek subjects. In his sixteenth year he wrote some verses commendatory of Sir Isaac Newton. In 1737 appeared *Leonidas*, an epic in blank verse running through 9 books, subsequently (1770) extended to

12 books. Once popular, the poem is no longer read. Its sequel, the *Athenaid* (30 books, 1787), probably no one ever read. He wrote several heavy tragedies: *Boadicea* (1753), *Medea* (1761), and *Jason* (1799). His fame now rests upon the spirited "Ballad of Admiral Hosier's Ghost," founded on Hosier's disastrous expedition to Porto Bello (1726). Glover died November 25, 1785. For his poems consult Chalmers, *Works of the English Poets*, vol. xvii. (London, 1810).

GLOVER, STEPHEN (1812-70). An English song-writer, born in London. He composed numerous songs and duets, including: "What Are the Wild Waves Saying?" "Stars of the Summer Night"; "Our Bark is on the Rhine"; "Annie on the Banks o' Dee"; and "There's a Sweet, Wild Rose."

GLOVER, WILLIAM HOWARD (1819-75). An English musical composer. He was born in London, and was the son of Mrs. Julia Glover, the actress. After completing his musical studies on the Continent, he founded, with his mother, the Musical and Dramatic Academy in London. In 1868 he settled in New York as leader of Niblo's orchestra. He produced a cantata, *Tam o' Shanter* (1855), an opera, *Ruy Blas* (1861), and several comic operas.

GLOVERSVILLE. A city in Fulton County, N. Y., 54 miles northwest of Albany, on the Fonda, Johnstown and Gloversville Railroad (Map: New York, F 2). It has a public library and the Nathan Littauer Hospital. Gloversville is the principal seat of the manufacture of gloves in the United States, its factories with those of the neighboring city of Johnstown controlling a large proportion of the entire production of the country. Besides gloves and mittens, there are extensive manufactures of glove and shoe leather. Settled during or just before the Revolution, Gloversville was known as Stump City from 1816 to 1832, when it received its present name. It was incorporated as a village in 1851, and was chartered as a city in 1890. The government, under the revised charter of 1899, is administered by a mayor, elected biennially, and a council which confirms the executive's appointments to the Board of Health, and elects all other officers, except standing committees, boards of civil service and plumbing, which are appointed by the mayor. The boards of education and water commissioners are chosen by the people. The city owns and operates its water-works. Population, in 1890, 13,864; in 1900, 18,349.

GLOVE SPONGE, or FINGER SPONGE (so called from the branching shape). An inferior sort of commercial sponge (*Spongia officinalis*) which takes a bushy form, sometimes two feet high. It grows on hard bottoms all along the coast of Florida and Bermuda, and is regarded as the poorest kind gathered, although closely related to the finest sort of sponge. See SPONGE.

GLOWWORM. See FIREFLY.

GLUB-DUB-DRIB. A land of magicians, soothsayers, alchemists, and the like, visited by Swift's Gulliver during his famous travels. The inhabitants, to entertain Gulliver, summoned the spirits of various notable men of olden times.

GLUCASE (from Gk. γλυκός, *glykys*, sweet). An enzyme also known as maltase, found in various species of yeasts, in some molds, and probably also in the seeds of germinating barley and

other cereals. It is also found in various parts of animal bodies. The glucase prepared from cereals differs somewhat in its action from that obtained from fungi; the latter acts best at a temperature of 40° C., and the former is most active at 57-60° C. Glucase acts upon maltose (sugar), breaking it up (by hydrolysis) into two molecules of glucose. It has also been found to decompose certain glucosides.

GLUCINUM, GLYCIUM, glīsh'ī-ūm (Neo-Lat., from Gk. γλυκίς, *glykys*, sweet), or **BERYLLIUM**. A metallic chemical element discovered by Wöhler in 1828. It is not found native, but occurs as a constituent of various minerals, such as beryl, chrysoberyl, and phenacite. Its existence as an oxide was recognized in beryl in 1798 by Vauquelin, but it was not until Wöhler obtained the impure metal by the action of potassium on fused glucinum chloride that the element itself may be said to have been isolated.

Glucinum (symbol Gl or Be; atomic weight 9.08) is a steel-colored, malleable metal that has a specific gravity of 2.1, and its melting-point is below 900° C. It is divalent and combines with oxygen, forming *glucinum oxide*, or *glucina*, a white infusible powder with a sweetish taste. The compounds of glucinum have no economic value.

GLÜCK, glük, CHRISTIAN FRIEDRICH VON (1755-1831). A German jurist, born at Halle. In 1784 he became professor of law in the University of Erlangen, Bavaria. Among his principal works are: *Ausführliche Erläuterung der Pandekten* (34 vols., 1790-1830; continued by other scholars, 1832-93); and *Handbuch zum systematischen Studium des neuesten römischen Privatrechts* (1812).

GLUCK, glōok, CHRISTOPH WILLIBALD (1714-87). A famous German composer and operatic reformer. He was born July 2, 1714, at Weidenwang, in the Upper Palatinate, where his father was forester to Prince Eugene of Savoy, and later to Prince Lobkowitz at Eisenberg. From 1726 to 1732 the boy attended a Jesuit seminary at Komotau, where he was taught singing, violin, 'cello, and organ. In the latter year he went to Prague to continue his musical studies, and was compelled to eke out a livelihood by playing in the neighboring villages. While there he heard and stored away in his memory many rustic tunes which later did service in his operas. Czernohorsky, noting his aptitude, took him as a pupil. In 1736 he went to Vienna, where, through the good offices of the Lobkowitz family, he met Prince Melzi. The latter became deeply interested in the young musician and took him to Milan, where Gluck continued his technical studies with Sammartini.

Gluck was twenty-seven years old when his first opera, *Artaserse*, was produced at La Scala. *Artaserse* led to commissions for other works, and within five years Gluck produced eight operas. His fame having reached England, he went to London in 1745 at the invitation of Lord Middlessex and produced *La caduta de' giganti* in honor of the Duke of Cumberland's victories. The time, however, was inauspicious, and *The Fall of the Giants* was withdrawn after only five performances. The performances of an earlier opera, *Artamene*, were more successful. Then occurred a circumstance of which Gluck's biographers have made much. To a libretto, *Piramo e Tisbe*, he

wrote a patchwork score from the most popular airs of his earlier operas. To the complete failure of this *pasticcio* is attributed the awakening of Gluck's mind to the true function of operatic music—the expression of given dramatic situations; although *Orfeo*, with which Gluck inaugurated his reform of opera, was not composed until sixteen years later.

In 1748, Gluck's father having died and left him a small inheritance, he settled in Vienna, which remained his principal place of residence for the rest of his life. On May 14, 1748, in celebration of the Empress's birthday, he produced in the recently completed opera house *La Semiramide riconosciuta*, which achieved great success. The spring of 1749 found the composer in Copenhagen, where he was received with distinction and lodged in the royal palace, and where he produced a two-act serenade, *Teside*, in honor of the recent birth of a Crown Prince (afterwards Christian VII.). In April of the same year he traveled in the guise of a Capuchin (for no other reason, it is believed, than to avoid trouble regarding passports) to Rome. There and in Naples he brought out a new two-act opera, *Telemacco, ossia l'Isola di Circe*, which was attended with his usual success.

Shortly afterwards Gluck returned to Vienna, where, in September, 1750, he married Marianne Pergin. They soon left Vienna for Naples, where he achieved great success with his opera *La clemenza di Tito*. In 1754, having produced, and again successfully, two operas, *Il Trionfo di Camillo* and *Antigone*, in Rome, the Pope created him a Chevalier of the Golden Spur, and thereafter the composer, who set great store by this title, was always careful to call himself Ritter von Gluck. Previous to this visit to Rome he had been appointed by Count Durazzo conductor of the Opera at Vienna. His productivity in this office was great, including the composition of light operas whose librettos Durazzo secured from Paris, where they were brought out with music usually by Duni and Monsigny, while the Viennese heard the same librettos with music by Gluck. Meanwhile Gluck was growing steadily in intellectual breadth. He became more and more dissatisfied with the flippant conventionalities of the Italian opera of the day—though he himself had composed an appalling number of works in that style—and, calling to his aid as librettist the Imperial Councillor Raniero di Calzabigi, who was in sympathy with his views on operatic reform, he produced at Vienna in October, 1762, *Orfeo ed Euridice*. This, his first great opera, is still a famous work and one of its airs ("Che farò senza Euridice") is a familiar concert number to-day. Though not immediately successful, *Orfeo* soon established itself in popular favor, not only in Vienna, but also in Italy, where, at Parma, Traetta was unable to obtain a hearing for his *Armida* because every one wanted to hear *Orfeo*. Gluck's other operas in his great style are *Alceste* (1767), *Paride ed Elena* (1769), *Iphigénie en Aulide* (Paris, 1774), *Armide* (1777), and *Iphigénie en Tauride* (1779).

The production of *Iphigénie en Aulide* in Paris was an important event in Gluck's life. It led to the hotly waged and now historic contest between the operatic reformers headed by Gluck and those who championed the existing style of opera. The latter put forward Piccini to oppose Gluck, but Gluck was overwhelmingly victorious. In

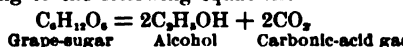
1780 he returned to Vienna, but ill health prevented him from accomplishing anything of importance, and he died in that city, November 15, 1787. Gluck's reform of the opera was his greatest service to music. He found it marred by senseless embellishments, and a mere vehicle for the display of singers' voices; he left operatic music restored to its original purpose of expressing musically the meaning of the words to which it was composed, and of emphasizing the dramatic situation. Consult: Marx, *Gluck und die Oper* (Berlin, 1863); Ferris, *Great Musical Composers* (New York, 1887); Newman, *Gluck and the Opera* (London, 1895); Reissmann, *Christoph Willibald von Gluck* (Berlin and Leipzig, 1882).

GLÜCKSTADT, glük'stät. A town in the Prussian Province of Schleswig-Holstein, on the Elbe, 32 miles below Hamburg (Map: Prussia, C 2). It is a pretty town, regularly built, and intersected by canals. It has a gymnasium, railway repair-shops, ship-yards, manufactures of furniture, wagons, mirrors, soaps, shoes, cigars, etc. The fisheries are important. When the Elbe is ice-bound the harbor receives much of the Hamburg shipping. It is very commodious and admits the largest vessels. Glückstadt was founded in 1620 by Christian IV. of Denmark, fortified, and endowed with various commercial privileges. During the Thirty Years' War it successfully withstood three sieges; its fortifications were demolished in 1815. Population, in 1890, 5958; in 1900, 6586.

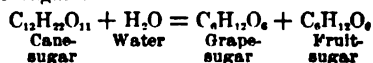
GLUCOSE (from Gk. γλυκός, *glykys*, sweet), **DEXTRO-GLUCOSE**, **DEXTROSE**, **GRAPE-SUGAR**, or **DIABETIC SUGAR**. One of the carbohydrates that are represented by the formula $C_6H_{12}O_6$. As ordinarily obtained, the crystals of dextro-glucose include one molecule of water for every molecule of the carbohydrate, and are therefore represented by the formula $C_6H_{12}O_6 + H_2O$. It occurs naturally in fruits (notably in grapes, cherries, bananas, apples, pears, plums, etc.) and other vegetable tissues, usually in mixtures with other carbohydrates, among the more important of which are fruit-sugar (also called levulose and dextro-fructose), cane-sugar, and starch. It may often be observed in the crystalline state on raisins and figs, and in 'candied' honey, of which it is also a constituent. It also occurs in plants in combination with organic acids, the compounds, called 'glucosides,' including the well-known salicin of the willow and amygdalin of bitter almonds. Glucose is one of the early products of photosynthesis (q.v.) in plants, in which it is formed from carbon dioxide and water, probably by the condensation of formaldehyde with the liberation of oxygen. As a food it is freely utilized by the plant producing it for the formation of more complex sugars, other carbohydrates, and proteids. It may be accumulated as a reserve in many fruits, e.g. the grape. Glucose is one of the best foods for fungi and has even been fed successfully to some seed-plants, e.g. corn, which in the absence of other foods can use it in producing starch. In the animal kingdom, grape-sugar is found sometimes as a normal and sometimes as a pathological constituent of various fluids and tissues. Thus, it occurs normally in the contents of the small intestine, and in the chyle after the use of amylaceous and saccharine foods, in the blood of the hepatic veins (see LIVER), in the tissue of the liver, in both the yolk and white

of birds' eggs, in the urinary secretion in minute quantity, etc. In diabetes, it exists in large quantity in the urinary secretion, and may be detected in nearly all the fluids of the body. The statement is frequently found in the older treatises on chemistry and medicine that grape-sugar is produced by the action of ptyalin and pancreatin on starch; but later researches have shown that the principal products of the action of these enzymes on starch are dextrin and maltose, intermediate products which are changed to glucose when treated with acids. (See further below.)

Dextro-glucose seldom occurs in distinct, well-formed crystals, but may be obtained in warty masses which, when examined under the microscope, are found to consist of minute six-sided tablets. It is white when pure, melts at from 80° to 100° C. (176°-212° F.), depending upon the manner of heating and the consequent rapidity with which it parts with its water of crystallization. At higher temperatures (above 200° C.) it loses its sweetness and passes into a brown unfermentable substance called caramel, which is soluble in water and has a bitter taste. This substance is prepared on a large scale from commercial glucose and, under the name of 'burnt sugar,' 'sugar-color,' or 'starch sugar-color,' is used for coloring foods, confectionery, liquors, etc. Grape-sugar is less sweet than ordinary cane-sugar. (See SUGARS.) Its relative sweetening power has been variously estimated at one-half to three-fifths that of cane-sugar. It is very soluble in water, but is only slightly soluble in strong alcohol. One of the most important properties of grape-sugar is its capacity for undergoing fermentation under the action of the yeast-plant. It is upon this property that the use of yeast depends in the manufacture of alcohol, distilled liquors, beer and other malt liquors, wines, and bread. In these processes grape-sugar is decomposed into alcohol and carbonic-acid gas, according to the following equation:

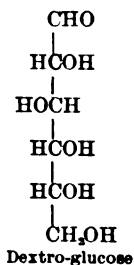


The power of decomposing grape-sugar and other carbohydrates is possessed by a number of species of the lower forms of vegetable life, the decomposition products varying greatly with the species and the conditions. The action of bacteria on sugars and other carbohydrates has been found to be a very valuable means of identifying a number of species of these microscopic organisms. For example, one species transforms grape-sugar into lactic acid, from which the subsequent or simultaneous intervention of another species of bacteria, butyric acid, may be obtained. Grape-sugar itself is produced by the hydrolysis of a number of carbohydrates which have more complex molecular structure. These changes, which consist in the splitting up of the more complex molecules with the simultaneous absorption of water, may be brought about by hot dilute acids or by contact with certain enzymes (q.v.). Cane-sugar is 'inverted' by treatment with dilute acids (see CATALYTIC ACTION), or by invertin (an enzyme produced by the yeast-plant), the product of the reaction, which is a mixture of equal parts of grape-sugar and fruit-sugar, known as 'invert sugar':



Milk-sugar, or lactose, is changed by dilute acids into grape-sugar and galactose; and raffinose ($C_{15}H_{32}O_{16}$) yields three different substances when treated with dilute acids, namely, grape-sugar, fruit-sugar, and galactose. When maltose and dextrin are treated with dilute acids, grape-sugar is the sole product.

Chemically, dextro-glucose is one of the so-called 'aldo-hexoses' (see SUGARS), its molecule containing one aldehyde group (CHO), four secondary alcohol groups (CHOH), and one primary alcohol group (CH_2OH). The synthesis of dextro-glucose was perfected in 1890, by Emil Fischer, who showed the structure of its molecule to be represented by the following graphic formula:



Dextro-glucose

COMMERCIAL GLUCOSE. The term glucose is also applied to mixtures of the substance described above with other carbohydrates, the various mixed products being otherwise called 'starch-syrup,' 'corn-syrup,' 'starch-sugar,' 'corn-sugar,' etc. Starch is the favorite material for the manufacture of commercial glucoses. Potato-starch is largely used for this purpose in Europe; in this country corn-starch is at present practically the only commercially possible raw material. The manufacture of corn-starch and the conversion of it into glucose are generally conducted in the same establishment, the two processes together constituting a very large industry. It was estimated in 1898 that the glucose industry of the United States annually consumes approximately 35,000,000 bushels of corn. In 1884 6,773,115 pounds of glucose and grape-sugar, valued at \$212,028, were exported by the United States; while during the fiscal year ending June 30, 1901, the exports of these commodities amounted to 204,209,974 pounds, valued at \$3,113,898.

For the manufacture of glucose from corn, the grain is first softened by treatment, for two or three days, with water containing a small percentage of sulphurous acid; then coarsely ground; and then treated with 'starch-milk' (a mixture of starch and water) of such a density that the lighter embryos, or 'germs,' float on the surface, whence they are removed, while the heavier parts of the kernels sink to the bottom of the liquid. The 'germs' are dried and sold for stock-feed after the extraction by hydraulic pressure of the oil they contain. This oil is found in commerce under the name of corn-oil or maize-oil. The parts of the kernel that sink are finely ground. The starch is thus set free so that it can be separated from the ground grain by washing on sieves. It is afterwards purified by successive mixing with water and sedimentation, or by deposition on 'starch-tables,' over which the washings from the sieves are allowed to flow. The starch, which is much heavier than water and the impurities from which it is to be freed,

collects at the bottom of the settling-vats in a hard white layer which, when drained, is called 'green starch' and is ready for conversion into glucose. The residue retained by the sieves and the nitrogenous matter, as well as the small amount of starch left in the wash waters, are collected, pressed, dried, and sold for stock-feed. See GLUTEN MEAL AND GLUTEN FEED.

For converting the starch into glucose (hydrolysis), hydrochloric acid is now very generally used, although for certain products sulphuric acid in mixture with a minute quantity of nitric acid is used. The operation is conducted in steam heated, closed copper 'converters,' under a pressure of two or three atmospheres (30 to 45 pounds per square inch). This high pressure greatly lessens the quantity of acid and the time necessary. In the case of sulphuric acid, from one to three pounds are used per 100 pounds of dry starch; in the case of hydrochloric acid, only one-half to three-quarters of a pound of the concentrated acid is necessary. The starch is mixed with a considerable quantity of water before the acid is added; the time required for the conversion varies from 10 to 30 minutes, according to the character of the required product, the time being much longer for solid starch-sugar than for syrupy glucose. By the action of the acid, the starch is first converted into dextrin and maltose; by continued treatment, these bodies are changed to grape-sugar. The syrupy products contain in some cases as much dextrin as grape-sugar, and a very large percentage of maltose, while in some of the dry products only traces of dextrin and maltose are found. As the liquor comes from the 'converter,' the acid is neutralized with chalk or marble dust, if sulphuric acid is used, or with soda if hydrochloric acid is used. In the former case, the gypsum or sulphate of lime formed crystallizes out, and is separated by filtration; in the case of hydrochloric acid, the neutralization product is sodium chloride (common salt), of which the quantity is so small that it does not injure the quality of the finished product. The neutralized liquid is decolorized by filtration through boneblack, and concentrated in vacuum evaporators to form a syrupy or a dry product, as may be desired.

Among the products of glucose factories, those of greatest commercial importance are 'mixing glucose,' used by syrup and molasses manipulators; 'jelly glucose,' used in making jellies from evaporated apple-juice and other materials; 'confectioners' glucose'; 'brewers' glucose,' used as a substitute for malt in brewing; and 'anhydrous starch-sugar.' Well-made glucoses must be regarded as a perfectly wholesome product, as they are composed of substances of frequent and abundant occurrence in foods that have been in use from time immemorial, and which are similar to the products into which starch is normally transformed by the processes of digestion. The objection to their use in the preparation of foods lies mainly in the fact that the consumer is frequently misled in regard to the value of the commodities containing them, and that they are frequently used in the fabrication of inferior, artificial or highly diluted, or otherwise adulterated goods.

Consult: Wagner, *A Practical Treatise on the Manufacture of Starch, Glucose, Starch-Sugar, and Dextrin*, translated by Frankel and Hutton

(Philadelphia, 1881); Hallock, *Bibliography of Starch-Sugar* (Washington, D. C., 1884).

GLUCOSIDE. A name applied to a number of organic substances occurring abundantly in plants. Chemically they are compounds of various sugars (usually grape-sugar) with organic acids, and they readily split up into their constituents under the action of acids, alkalies, or certain ferments. Thus, *amygdalin*, $C_{20}H_{27}NO_{11}$, a glucoside found in bitter almonds and other vegetable products, is decomposed by the ferment named emulsion into dextrose (a sugar), benzaldehyde, and hydrocyanic acid. (See ALMONDS, VOLATILE OIL OF.) Again, *myronic acid*, $C_{10}H_{16}NS_2O_{10}$, a glucoside found in black mustard, is decomposed by baryta water, or by the action of the ferment named myrosin, into glucose, allyl,

mal yield the better glue. Fish glue is made from the skin, scales, and muscular tissue of some of the larger fish, and is, of course, a very different product from true isinglass (q.v.). In its adhesive powers it resembles hide glue, but it retains an offensive odor. The raw material of most glue-factories is chiefly composed of the waste from slaughter-houses and from leather-manufactories—the trimmings of hides and bones, and scraps of leather or pieces of old leather which was cured by some other process than tanning. Glue, however, cannot be made from material in which the slightest trace of tannic acid remains.

The accompanying statistics regarding the manufacture of glue in the United States are taken from the United States Census of 1900:

	Total number of pounds	Made from hide, trimmings, etc., fur, or neat's-foot stock	Made from bone or bone liquor
		Pounds	Pounds
Glue establishments.....	34,984,448	29,036,901	3,109,165
Slaughtering establishments.....	34,516,761	12,780,832	20,183,562
United States.....	69,501,209	41,817,733	23,292,727
		Made from cattle, hogs, etc.	Made from fish skins and waste
		Pounds	Pounds
Glue establishments.....	66,666	2,731,156	40,560
Slaughtering establishments.....	1,282,367	270,000	.....
United States.....	1,349,033	3,001,156	40,560

The value of imports of hide cuttings, raw, and all other glue stock and hide rope entered for consumption in the United States during the fiscal year of 1899-1900, was \$1,207,572.03, and the value of imports of glue was \$526,544.05.

iso-sulphocyanate, and acid potassium sulphate. Another well-known glucoside is *quercitrin*, $C_{20}H_{30}O_{20}$, which occurs in the bark of the *Quercus tinctoria* and is used as a yellow dye. The glucoside *convolvulin* $C_{21}H_{36}O_{16}$, which is found in jalap-roots, acts as a strong purgative. The *tannins* are glucosides of aromatic acids. Many of the glucosides have been reproduced artificially, and, their chemical constitution being fairly well known, have been distributed among the several classes of carbon compounds to which they naturally belong. Those glucosides, however, whose constitution is as yet unknown, or but imperfectly known, are still generally grouped together.

GLUE (from OF. *glu*, bird-lime, from Lat. *glus*, glue; connected with Gk. *γλοιος*, *gloios*, glue, Eng. *clay*). An inferior grade of gelatin, prepared, on account of its adhesive qualities, for use in the arts and industries, and particularly in the various branches of wood-working. A preparation of glue or other gelatinous material for glazing the surface of a textile fabric, paper, or other material is known as 'size.' With the development of the textile, paper, and allied industries, the use of glue as sizing has enormously increased the demand for this article and its consequent commercial importance. The best glue-making material is the corium or true skin of the animal, that portion, lying beneath the epidermis and inner layer of fat, which is also used for the manufacture of leather. The glue extracted from the bones of animals is inferior in adhesive qualities. The softer bones of an ani-

The method of glue manufacture varies with the character of the material employed. In making glue from hide, the scraps are first limed, to facilitate the removal of adhering hair, flesh, and fat, as in the manufacture of leather (q.v.). This process requires from ten to forty days, after which the skins are washed and dried. Instead of lime, caustic soda or sulphurous acid is sometimes used for cleansing the glue stock. The prepared stock is converted into glue by the application of heat. By an older method, the pieces are placed in flat-bottomed copper boilers, which have a perforated false bottom placed a little above the true one, to prevent the burning of the materials. The whole is kept at a gentle boiling heat until the gelatinous part has boiled out, and the mass of the material has sunk down into the fluid. The boiler is at first filled with soft water for two-thirds of its depth. The boiling is sustained until, by repeated trials of small quantities, the operator knows the fluid to be of the right consistency, when it is drawn off to the congealing-boxes: a fresh lot of material is often added to the residue left in the boiler, and the process is repeated. Recently, the use of steam, either indirectly in closed pipes or directly in perforated pipes, or else blown under high pressure directly into the closed vessel containing the mixture, has been found to expedite the process and improve the quality of the glue. After boiling, the glue is allowed to settle, or is strained through linen bags to free it from impurities. The waste thus recovered, consisting of fat, hair, and other matter, is utilized in the

manufacture of fertilizers, while the glue itself is subjected to a process of drying. Drying is likely to prove a troublesome process, requiring great care, as the glue readily spoils at this stage. Until recently, drying was accomplished in the open air, but the more recent practice is to place the glue in specially prepared drying-rooms where the temperature and humidity can be carefully regulated. The glue is dried in shallow wooden molds. Thence it is removed to a smooth-topped table, whose surface has been moistened to prevent sticking, and here it is cut, by means of wires, into pieces of the desired shape and size. Fish glue is made by a similar process.

Bone glue is extracted by boiling the bones, which have been previously treated with a solution of hydrochloric acid, to remove the calcium phosphate. The powdered bones are kept in a solution of dilute hydrochloric acid for several days. They are then allowed to stand in lime-water for a few hours, after which the gelatin is extracted by means of boiling water or steam, as in the preparation of hide glue. The calcium phosphate recovered from the bones is used as fertilizing material, and the fat is also utilized.

Liquid glue is prepared from a solution of dried glue by the action of nitric or acetic acid, which checks its tendency to gelatinize without diminishing its adhesive qualities. An excellent liquid glue may be made by mixing four parts of transparent gelatin, four parts of strong vinegar, one part of alcohol, and a small amount of alum.

GLUE, MARINE. A waterproof cement made by dissolving one part of finely divided india-rubber in 12 parts of naphtha or benzine, then adding 20 parts of powdered shellac, and digesting at a gentle heat until the shellac is dissolved. The fused mass, while still hot, is poured on plates of metal or stone, so as to form thin sheets. For use, it is liquefied by heating, and is then applied with a brush. Owing to its property of resisting moisture, it is much used in ship-building, to unite surfaces exposed to water; and it is also valuable as a cement for glass, metal, and stone.

GLUGÆ'A BOMBYCIS. A parasite of the silkworm, which formerly did immense injury to the silk industry of France.

GLUKHOV, глѣховъ. The capital of a district of the same name in the Russian Government of Tchernigov, situated on the Yesmana, 180 miles south-southeast of Tchernigov (Map: Russia, D 4). The chief occupation is agriculture; the trade is insignificant. The town existed as early as the twelfth century, and passed to Lithuania in the fourteenth century, and later to Poland. It was the seat of the hetmans of Little Russia. Population, in 1889, 16,969; in 1897, 14,856.

GLUMDAL/CA. A captive Brobdingnagian Queen at Arthur's court, in Fielding's burlesque *Tom Thumb*. The much-married King Arthur is attracted to her, but Tom Thumb is the master of her heart.

GLUMDAL/GLITCH. A maiden giantess of Brobdingnag, nine years old and forty feet high, in Swift's *Gulliver's Travels*. She becomes deeply attached to her pigmy ward, but her attentions often threaten the safety of his life and limbs.

GLUME, glōom (Lat. *gluma*, husk, from *glubere*, to peel, Gk. γλύφειν, *glyphein*, to carve). The characteristic bract which distinguishes the inflorescence of grasses, which on this account are often spoken of as 'glumaceous plants.' See GRAMINEÆ.

GLÜMER, glü'mër, ADOLF VON (1814-96). A German soldier. He was born at Lengefeld, and after receiving a military education, entered the Prussian Army, in which he won rapid promotion, and participated in the Austro-Prussian War of 1866. In the Franco-German War he especially distinguished himself, serving as a division commander at Spichern, Forbach, Gravelotte, and Metz. He also took a prominent part in the battle around Belfort.

GLÜMER, CLAIRE VON (1825—). A German author, born at Blankenburg, in the Harz Mountains, and educated chiefly in France. Her translations of English, French, and Russian authors include various works of Swift, Lanfrey, Daudet, Feuillet, George Sand, Turgenieff, Tolstoy, and others. Her original productions include novels and romances such as: *Düstere Mächte* (1870); *Tom Webstuhl der Zeit* (1882); *Junge Herzen* (1890); *Es giebt ein Glück* (1897).

GLUTEN (Lat., glue). One of the most important constituents of the varieties of corn used as food. It is obtained by mixing flour with water, and thus forming a paste or dough. This paste is placed in a bag of fine linen, and kneaded in water, which must be repeatedly changed, till it ceases to assume a milky appearance. A gray, tenacious, viscous, tasteless substance, having the appearance of bird-lime, is left in the bag. This substance consists mainly of gluten, mixed with traces of bran starch and of oily matter. The gluten thus obtained from wheat and from rye is far more tenacious than that which is obtained from the other cereals, and it is the great tenacity of this constituent that especially fits these flours for conversion into bread. It is found, by analysis, that the proportion of gluten contained in wheat grown in hot countries is considerably higher than in wheat grown in colder countries; and the hard, thin-skinned wheats contain more of this ingredient than the softer varieties of the grain. Gluten in a moist state rapidly putrefies, the mass acquiring the smell of decaying cheese; but when dry, it forms a hard, brownish, horny-looking mass, that does not very readily decompose. On treating gluten with hot alcohol, it resolves itself into at least two distinct substances, one of which is soluble, and the other insoluble in that fluid. The insoluble portion is vegetable fibrin. It is a gray, tough, elastic substance, insoluble in water or in ether, but readily soluble in dilute alkalies, from which it is precipitated by neutralization with acetic acid. It is also soluble in very dilute hydrochloric acid, from which it is thrown down by the neutral salts. The soluble portion is in part precipitated from the alcohol on cooling, in the form of flakes, which have the composition and properties of casein; while a third substance, known as *gliodin*, remains in solution, giving to the alcohol a syrupy consistence. It separates, on the addition of water, as a white substance resembling albumen. All these constituents of gluten contain carbon, hydrogen, nitrogen, oxygen, and sulphur, in much the same proportion as the proteids, and they all doubtless belong to the

flesh-forming group of foods. The action of gluten in the manufacture of bread is probably a double one; it induces, by constant action, an alteration of the starch, and subsequent fermentation, while by its tenacity it prevents the escape of carbonic-acid gas.

The large quantities of gluten obtained as a by-product in the manufacture of starch are at present utilized for the manufacture of certain articles of food.

GLUTEN MEAL AND GLUTEN FEED.

By-products resulting in the manufacture of starch or glucose from the starch of the corn-kernel. Their principal use is as a feeding stuff for farm animals. The by-product differs greatly in composition according to the process of manufacture which is followed. Gluten feed is the entire residue of the kernel, including the germs and hulls. Gluten meal, cream gluten, and similar materials sold under a variety of trade names, do not contain the corn-hulls. Some factories extract a part of the fat from the gluten meal; others mix the gluten meal with the hulls and germs, without extracting the fat, and sell it as gluten feed. The dried products from the same factory vary considerably in composition from time to time, so that although a very large number of samples of gluten meal and feed have been analyzed by the experiment stations, no very reliable figures can be given for percentage composition. In general, the gluten meals are richer than the gluten feeds. These meals contain from 20 to 40 per cent. of protein, the average being about 30 per cent., and from 6 to 20 per cent. of fat, with an average of nearly 12 per cent. The carbohydrates constitute about 45 per cent., and the fibre varies with the completeness of the separation of the hulls, rarely amounting to over three or four per cent. The gluten feeds usually contain about 24 or 25 per cent. of protein, although the product from some factories has been below 20 per cent., and of others over 30 per cent. The fat varies less than in gluten meal, averaging about 10 per cent.; and the carbohydrates are higher, averaging over 50 per cent. Like other corn products, none of these materials contain much ash—less than 1 per cent. usually.

Gluten meal and feed are both quite digestible, from 85 to 90 per cent. of the protein, 90 to 95 per cent. of carbohydrates, and 85 to 95 per cent. of the fat being digested by ruminants. They are highly prized as feeding stuffs, especially for dairy cows, and are now very extensively used over the northeastern part of the United States. Gluten meals, when fed to cows in considerable quantity, cause a slight softening of the butter, but give a product of good quality. Gluten meal is also a satisfactory feed for fattening steers, and for pigs.

GLUT HERRING. A 'river-herring' (*Clupea astivalis*), closely related and similar to the alewife, and often confused with it in the market, although considered inferior. It is more commonly known on the New England coast as 'blueback.'

GLUTTON. The English name for the European representatives of the circumpolar carnivore known in North America as the wolverine (*Gulo luscus*). The fables to which it owes its name, and the equivalents in all European languages, are sketched and considered by Dr. Elliott Coues in his *Fur-Bearing Animals* (Wash-

ington, 1877). In the early books about animals this denizen of forests, popularly supposed to be more or less filled with hobgoblins anyhow, was represented as a ravenous monster of insatiate voracity, matchless strength, and supernatural cunning. For the real character of the animal whose name perpetuates these foolish calumnies, the reader is referred to the article **WOLVERINE**, and the Plate of **FUR-BEARING ANIMALS**.

GLYCE'RIA. See MANNA GRASS.

GLYCERIN, glis'ēr-in, **GLYCEROL** (from Gk. γλυκερός, *glykeros*, sweet, from γλυκίς, *glykys*, sweet), or **PROPENYL ALCOHOL**, $C_3H_8(OH)_3$. An organic chemical compound, used for a variety of purposes in the arts and in medicine. Perfectly pure glycerin is a crystalline solid substance melting at 17° C.; but the merest traces of impurities prevent it from crystallizing, and it is therefore usually obtained in the form of a thick syrupy liquid that boils at 290° C. Small quantities of salts cause it to decompose to some extent when distilled. Glycerin mixes in all proportions with water and alcohol, and readily absorbs moisture if exposed to the air, but does not mix with ether, chloroform, carbon disulphide, benzene, and many other organic liquids. On the other hand, it forms an excellent solvent for a variety of substances, both inorganic and organic. It is colorless and odorless, but has a distinctly sweet taste. Its specific gravity at 15° C. is 1.265. Glycerin is obtained in large quantities in the manufacture of soap and of candles. It is well known that natural fats are largely used in the manufacture of these products, and as fats consist mainly of glycerides, i.e. compounds of glycerin with fatty acids, glycerin is set free when the fats are decomposed, or 'saponified.' It is thus obtained, in more or less dilute aqueous solution, through the saponification of fats with lime or with superheated steam. To separate the glycerin from the dilute solution, the latter is somewhat concentrated by evaporation, filtered through boneblack, and then further evaporated *in vacuo*. To render it fit for use in medicine and in the manufacture of nitroglycerin, the product thus obtained is further purified by distillation with superheated steam before it is brought into the market. Finally, to eliminate, for scientific purposes, the last traces of impurities in the commercial product, the latter may be again mixed with water, filtered through carefully purified boneblack, and evaporated *in vacuo*. In medicine glycerin is used chiefly as a vehicle for applying externally many substances, such as the alkalies, neutral salts, bromine, iodine, alkaloids, tannic acid, etc.. the glycerin solutions of which are readily absorbed by the skin. If injected into the rectum, glycerin relieves constipation, its action being speedy, painless, and followed by no constitutional disturbance. Very large doses of glycerin taken internally are liable to cause loss of muscular strength, lethargy, and even death. In the arts, glycerin is employed mainly in the manufacture of nitroglycerin, from which many valuable modern explosives are made; nitroglycerin is the tri-nitrate of glycerin, $C_3H_5(ONO_2)_3$, obtained by the action of nitric acid on glycerin. Glycerin is further used as a preservative fluid for small and delicate anatomical preparations, and has been applied to the preservation of meat and other foods; it has been added to the water in gas-meters, with the

view of preventing it from freezing in winter and from evaporating too rapidly in summer. It is also used in the manufacture of toilet-soap, of parchment paper, and of printers' rollers, in the textile industry, etc.

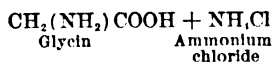
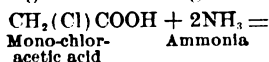
Chemically glycerin is a tri-atomic alcohol, its constitutional formula being $\text{CH}_2(\text{OH})\cdot\text{CH}(\text{OH})\cdot\text{CH}_2(\text{OH})$. When the hydrogen of its hydroxyl groups is replaced by metals or by organic acid radicles, alcoholates or esters, respectively, are obtained. Fats are mixtures containing, in various proportions, mainly the esters which glycerin forms with oleic, palmitic, and stearic acids. The hydroxyl groups of glycerin may be readily replaced by chlorine or bromine, one or two atoms of chlorine being thus substituted by the direct action of hydrochloric acid, while the third hydroxyl group may be replaced by chlorine by the action of phosphorus pentachloride. Besides the method described above, by which glycerin is made on an industrial scale, it may be prepared by the action of potassium permanganate on allyl alcohol, and it is produced in small quantities during the alcoholic fermentation of sugars. By the action of acid potassium sulphate or other dehydrating agents on glycerin, or simply by distilling impure glycerin under ordinary atmospheric pressure, acrolein is produced according to the following chemical equation:



When carefully oxidized with dilute nitric acid, glycerin is transformed into glyceric acid, $\text{CH}_2(\text{OH})\cdot\text{CH}(\text{OH})\cdot\text{COOH}$. Usually, however, the products of oxidation of glycerin are oxalic, carbonic, and glycollic acids.

Glycerin was discovered by Scheele in 1779; Chevreul demonstrated its existence, in the form of glycerides, in the fats; its composition was determined by Pelouze, and its chemical constitution by Berthelot and Wurtz. Finally, Charles Friedel, in collaboration with Silva, succeeded in effecting the complete synthesis of glycerin from its chemical elements; their method, however, is too complicated to be described here.

GLYCIN (from Gk. γλυκίς, *glykys*, sweet), GLYCOCINE, GLYCOCOLL, SUGAR OF GELATIN, or AMIDO-ACETIC ACID, $\text{CH}_2(\text{NH}_2)\text{COOH}$. An organic chemical compound of carbon, hydrogen, oxygen, and nitrogen. It occurs in colorless, transparent, rhombic prisms, which have a sweet taste, and are devoid of odor. It is very soluble in water, but is insoluble in alcohol and in ether. Glycin combines both with acids (as hydrochloric, nitric, sulphuric, and oxalic acid) and with metallic oxides, and the compounds in both cases are soluble and crystallizable; they are, however, of no great importance. Glycin is usually prepared by subjecting hippuric acid to prolonged boiling with hydrochloric acid, benzoic acid being produced at the same time. It is also sometimes prepared synthetically, by the action of ammonia upon mono-chlor-acetic acid, according to the following chemical equation:



Glycin exists in the animal body only in combination; it is one of the chemical components

of hippuric acid and glycolic acid, two substances of considerable physiological importance. It is, further, one of the products obtained by boiling gelatin with acids or with alkalies, and is produced also when uric acid is subjected to the action of hydriodic acid.

GLYCOCINE. See GLYCIN.

GLYCOCOLL. See GLYCIN.

GLYCOGEN (from Gk. γλυκίς, *glykys*, sweet + -γενής, -*genēs*, producing, from γίγνεσθαι, *gignesthai*, to be born), or ANIMAL STARCH, $(\text{C}_6\text{H}_{10}\text{O}_5)_n$. An organic substance found in considerable quantities in the liver, in muscles, in white blood-corpuscles and pus-corpuscles in the body of mammals, and even in larger quantities in many mollusks, including the common oyster. It is a carbohydrate extremely similar to vegetable starch. Pure glycogen is an amorphous white powder, readily dissolving in water and reprecipitated from its aqueous solution by the addition of alcohol and of a trace of common salt. It may be prepared from the liver of a dog to which considerable amounts of carbohydrate food have been given: the liver is cut into small pieces and boiled with water; the liquid thus obtained is acidified for the purpose of separating the soluble proteid matter, and on filtering and cooling glycogen is precipitated with an excess of strong alcohol; it is purified by washing with alcohol and ether. When heated with dilute mineral acids, glycogen is like starch gradually and completely transformed into dextrose. By the action of saliva, glycogen is transformed into dextrin and a sugar. The hepatic cells of the liver convert glycogen into sugar. The uses of glycogen in the animal economy are noticed in the article LIVER (q.v.).

GLYCOL (from *glyc-erin* + *alcoh-ol*), or, more properly, ETHYLENE GLYCOL, $\text{C}_2\text{H}_4(\text{OH})_2$. A thick liquid, having a sweet taste, and boiling at 197.5°C . It cannot be mixed with ether, but mixes in all proportions with water and ordinary alcohol. It may be prepared by heating ethylene di-bromide with an aqueous solution of potassium carbonate, evaporating the resulting solution at a gentle heat, extracting the semi-solid residue with a mixture of alcohol and ether, and subjecting the solution thus obtained to fractional distillation. Ethylene glycol is the simplest substance of the group of glycols, or di-atomic alcohols, a general description of which may be found under ALCOHOLS. A detailed account of the glycols was given by their discoverer, Adolphe Wurtz, in a lecture delivered before the Chemical Society of Paris. Consult Pasteur, Cahours, Wurtz, etc., *Leçons de chimie professées en 1860* (Paris, 1861).

GLYCON (Lat., from Gk. Γλύκων, *Glykōn*). An Athenian sculptor, who lived probably in the first century B.C. He executed the celebrated colossal marble statue of the Farnese Hercules, discovered in the baths of Caracalla in 1540. After adorning the Farnese Palace for some time, it was removed to the Royal Museum at Naples. It represents the hero resting on his club after one of his labors, and is supposed to have been copied from the Heracles of Lysippus. No ancient writer mentions Glycon, but ΓΛΥΚΩΝ ΑΘΗΝΑΙΟΣ ΕΠΟΙΕΙ ('Glycon, the Athenian, made it') is engraved on the rock which supported the statue. Consult Brunn, *Geschichte der griechischen Künstler* (Brunswick, 1853).

GLY'COSU'RIA (Neo-Lat., from Gk. γλυκύς, *glykys*, sweet + ὄσρον, *ouron*, urine). A symptom of diabetes mellitus. See **DIABETES**.

GLYKAS, MICHAEL. A Byzantine historian. Little is known of his life. His *History of the World*, from the earliest times to 1118, is a valuable work of reference, and contains many interesting references to theological and other matters. The best edition of the work was published by Bekker (Bonn Collection, 1836). Glykas is said to have been imprisoned and condemned to death about the middle of the twelfth century. A poem, containing nearly 600 verses, addressed to the Emperor Manuel Comnenus, is valuable as one of the earliest examples of vulgar Greek.

GLYNN, JOHN (1722-79). An English politician and lawyer. He studied at Oxford, but got no degree. Called to the bar in 1748, he soon became famous for his wide knowledge of law and for his radical position in politics. This combination made him a valuable friend and adviser of John Wilkes, for whom Glynn acted in many cases. In 1772 he was counsel for an alderman named Townsend in a suit against a land tax, in which he urged the nullity of Parliament on the ground of irregular elections. In 1768 he was elected to Parliament after an exciting campaign, marked by much violence and corruption; in the next year he presented the Middlesex petition, and in 1770 urged a committee to inquire into cases in regard to the press.

GLYNNE, Sir JOHN (1603-66). An English jurist and Parliamentarian. He was born at Glynllifon, Carnarvonshire, and was educated at Westminster School and Oxford. Called to the bar in 1628, by 1639 he was a leading member of the famous Long Parliament, and shared in the impeachment of Strafford. He was recorder of the City of London for six years (1643-49), and retired on an annual pension of £300. Though a stout adherent of Cromwell, and a most able prosecutor of his would-be assassins, Glynn was no republican, and urged the Protector to call himself King. After the Restoration he devoted his great abilities as judge and advocate to the service of Charles II., bringing to trial some of his former associates. But he was no ordinary turncoat, and remained true throughout to the Presbyterian party.

GLYPTICS. The art of engraving, particularly as applied to the carving of precious stones. It is now generally performed by means of diamond-dust and diamond-pointed instruments. In addition to gems, the engraving of various substances, such as coral and ivory, and unusually hard woods, such as box and ebony, is included under this head. See **ENGRAVING**; **GEMS**; **CUNEIFORM INSCRIPTIONS**.

GLYPTODON (Neo-Lat., from Gk. γλυπτός, *glyptos*, carved + ὀδούς, *odous*, tooth, in allusion to the sculptured grinding surface of the teeth). A gigantic extinct edentate mammal allied to the armadillo, and of which fossil remains are found in the Pleistocene deposits of South America, and less commonly in Mexico, Texas, and Florida. The animal had a solid carapace made up of mostly hexagonal plates arranged in transverse rows, like those of the armadillo, but solidly united, so that the creature was unable to curl up.

These bony plates were often ornamented by grooves or tubercles, and were covered by horny epidermal scales. The tail also was encased in a sheath of strongly nodular bony plates. The head likewise had, in some species, a coat of mail of small plates. The skull is high, narrow, and short, with a peculiar long process descending from the zygomatic arch. Both the jaws have eight molar teeth on each side, each of which is divided into three vertical prisms by two deep lateral grooves, and the form of the crown sculpturing is very peculiar. The legs are heavily built, the feet large, and the fingers are short, and armed with thick hoof-like claws. The latter character shows that the animal could not have been a burrower like the armadillo. The best-known species is *Glyptodon clavipes* of the Pleistocene beds of Argentina, which attained a length over all of about seventeen feet. An allied genus is *Dædicurus*, of even larger size than *Glyptodon*, with a smooth carapace pierced by many cavities, and a longer tail formed of five or perhaps six movable rings, terminated by a club-shaped tube, which seems to have borne movable spines or bosses at its extremity.

Consult Lydekker, "The Extinct Edentates of Argentina," in *Anales de Museo de la Plata, Paleontologia Argentina*, vol. iii., part ii. (La Plata, 1894). See **EDENTATA**.

GLYPTOTHE'CA, or **GLYPTOTHEK'** (Ger., from Gr. γλυπτός, *glyptos*, carved + θήκη, *thêkê*, chest). A building or room for the preservation of sculpture. Such buildings were common in ancient times. Cicero gives a minute description of one. The most famous modern gallery of sculpture called by this name is the Glyptothek in Munich (q.v.).

GMELIN, gma'lén, CHRISTIAN GOTTLÖB (1792-1860). A German chemist, born in Tübingen. His discovery of the artificial preparation of ultramarine was highly important in its bearing on manufacturing industry. His principal work is entitled *Einleitung in die Chemie* (1833-37).

GMELIN, JOHANN GEORG (1709-55). A German botanist. He was born in Tübingen, was educated in the university there, and in 1731 became professor of chemistry and natural history at Saint Petersburg. In 1733, by order of the Empress Anne, he joined Deslisle, G. F. Müller, and Bering in an expedition for the exploration of Siberia, which country they penetrated as far as the Lena. He returned to Saint Petersburg in 1743. In 1749 he was chosen professor of botany and chemistry at Tübingen. He published *Flora Sibirica* (1747-69) and *Reise durch Sibirien* (1751-52). Linnæus named a genus of plants *Gmelina* in his honor.

GMELIN, LEOPOLD (1788-1853). A German chemist. For several generations members of the Gmelin family have distinguished themselves in science. Leopold's father, Johann Friedrich, held professorships of natural history and medicine at Tübingen and Göttingen. Leopold was professor of medicine and chemistry at Heidelberg from 1817 to 1851. In 1820 he undertook, in conjunction with Tiedemann, a series of experiments on digestion, and in 1826 they published their celebrated work on the subject, in two volumes, under the title *Die Verdauung*. Gmelin is famous chiefly, however, for his admi-

rable and elaborate *Handbook of Chemistry* (1817-19), which was subsequently revised and enlarged by Kraut; Gmelin-Kraut's *Handbuch* is well known to every student of chemistry. An English translation of the work (under the auspices of the Cavendish Society), with important additions by Watts, the translator, was published in the course of 1848-59. Consult obituary in the *Journal of the Chemical Society* (London, 1855).

GMELIN, SAMUEL GOTTLIEB (1744-74). A German botanist and traveler, nephew of J. G. Gmelin. He was born in Tübingen, graduated there in 1763, went to Saint Petersburg in 1767, and in 1768, with Gölldenstadt and Lapuchin, entered on a journey for the scientific exploration of the southeastern possessions of Russia. When on his way back to Saint Petersburg he was seized as a hostage by Usmei Khan, of the Kaitak tribe, as a result of whose ill-treatment he died. He published: *Historia Fucorum* (1768); *Reisen durch Russland* (1771-84); and other works.

GMElina, mēl't-ná or mē-l'na (Neo-Lat., named in honor of the German traveler J. G. Gmelin, 1709-55). A genus of trees of the order Verbenaceæ, with heart-shaped leaves and panicles of flowers consisting of a small four or five toothed calyx, and a large obliquely bell-shaped corolla. *Gmelina arborea*, called goombar or koombar in Hindustan and the Eastern Peninsula, where it is widely distributed and attains a great size, is valuable for its timber, which resembles oak, but is closer in grain and lighter. It is used for many purposes, such as foundations for buildings, decks of boats, Venetian blinds, picture-frames, etc. It bears exposure to water better than do most kinds of timber. This tree has been successfully grown in the south of Florida and in California. In Australia there are two species that yield important timber—*Gmelina macrophylla* and *Gmelina leichhardtii*. The latter attains a height of 120 feet, with a diameter of 4 feet, and is one of the most valuable timbers of the country, where it is known as beech or white beech, although it is in no way related to the white beeches of Europe and America. The sap-wood of the former species is mottled, heavy, close-grained, and valuable.

GMÜND, gmynt. A town of the German Kingdom of Württemberg, situated in the beautiful valley of the Rems, about 32 miles southeast of Stuttgart (Map: Germany, C 4). The most noteworthy churches are the Romanesque Church of Saint John and the fourteenth-century Church of the Holy Cross, with a sculptured portal and a carved altar. The thirteenth-century Dominican monastery of Gotteszell is now used as a prison, and the Church of Saint Salvador, situated outside of the town, is visited by many pilgrims. Gmünd is well provided with educational as well as benevolent institutions. The chief manufactures are wooden and iron articles, flour, and especially jewelry and other gold and silver goods. There is a considerable trade in local manufactures. Gmünd, first mentioned in the twelfth century, became an Imperial free city in the thirteenth century, and retained its independence until 1803. Population, in 1890, 16,818; in 1900, 18,699.

GMÜND, von. A German family of stonecutters. For the more important members, see **PARLER**.

GMUNDEN, gmōōn'den. A favorite summer resort and watering-place of Upper Austria, charmingly situated at the northern end of Lake Traun, 1395 feet above the sea, about 50 miles northeast of Salzburg (Map: Austria, C 3). It is well built and lighted by electricity, and has many handsome villas in the environs. Being in the most picturesque part of the Salzkammergut, Gmunden offers many delightful excursions. Population, in 1890, 6476; in 1900, 7126.

GNAT (AS. *gnæt*). A name applied to several kinds of small flies, and in England to mosquitoes. Having been replaced by 'mosquito,' the word is becoming obsolete in North America. The commonest form to which it is still applied are the fungus-gnats (Mycetophilidæ) and the gall-gnats of the family Cecidomyiidae. The fungus-gnats are mosquito-like, but are easily recognized by the great length of the coxal (or uppermost) joint of the leg. They are found in great numbers on fungi and around decaying vegetable matter found in damp places. They can leap actively, as well as fly. The gregarious larvæ live in such vegetable matter. In some species the larvæ before pupating will form a marching army in which the individuals are four to six deep. The gnats of the dipterous genus *Sciara* frequently swarm in houses during summer evenings. The gall-gnats have the body and wings covered with long hairs, that are easily lost. The larvæ are small maggots, often bright-colored, and live in plants, in which they form galls. The Hessian fly that infests wheat belongs here, and also the resin-gnat that infests pine. See **FUNGUS-GNAT**; **GALL-GNAT**; **MOSQUITO**; **BLACK FLY**.

GNAT-CATCHER. A small insectivorous bird, related to the Old World warblers, and peculiar to America, especially to Central and South America. About fifteen species are known, of which three reach the United States. The coloration is bluish-ash, paler below; tail black and white. They are said to be good singers. The commonest species is the blue-gray gnat-catcher (*Poliophtila carulea*), which is found in summer as far north as Massachusetts, from the Atlantic to the Pacific. It breeds throughout its range, making a singularly beautiful nest in the form of a tiny cup, set upon the upper side of a lofty tree-limb, and coated with lichens until it simulates a mossy excrescence. Two other species are found in the Southwestern United States, near the Mexican border.

GNATHO, nā'thō. A sycophant in Terence's *Eunuchus*, and in later comedy the typical name for a parasite.

GNATHOBDELLIDA, nāth'ōb-dēl'i-dā (Neo-Lat. nom. pl., from Gk. γνάθος, *gnathos*, jaw + βδέλλα, *bdella*, leech). The order of worms of the class Hirudinea which includes those leeches that have no proboscis, as the common parasite leech, the horse-leech, the land-leech, and related forms. See **LEECH**.

GNAT-SNAPPER. A name given to certain Old World birds that seize insects on the wing, often with an audible snap of the beak, such as the bee-eater (q.v.).

GNAUTH, gnout, ADOLF (1840-84). A German architect, born in Stuttgart, where he was educated at the Polytechnic Institute. In 1861-63 he pursued his studies in Italy, whither, after a stay in Vienna, he went again in 1864, to collaborate with Emil von Förster in making the designs for Raschdorff's *Palustarchitektur von Oberitalien und Toscana* (Berlin, 1883), and where he was once more during the summer months of 1867-69, painting large-sized water-colors of the monuments of the Renaissance for the Arundel Society in London. Appointed professor at the Polytechnicum in Stuttgart, in 1870, he resigned in 1872, in order to execute orders for the erection of a number of private buildings. He visited Greece and Egypt in 1875, Spain and Southern France in 1882, and became director of the Industrial Art School at Nuremberg in 1877. An adherent of the late Renaissance style, he adapted in an original manner the palatial architecture of Italian cities to his structure.

GNEDITCH, gnä'dich, NICOLAI IVANOVITCH (1784-1833). A Russian poet. He was born at Poltava, and was educated at the University of Moscow. He went to Saint Petersburg at the age of nineteen, and was employed there in the Ministry of Education and in the Imperial Public Library. He devoted especial attention to translation of the classical poets of Europe, his best work in that field being the Russian version of the *Iliad* (latest ed. 1880). The work was begun in 1809 and completed in 1829, and is a masterpiece of versification. He wrote several original poems of high merit, and translated into Russian some works of Shakespeare, Voltaire, Schiller, and other European poets.

GNEISENAU, gní'ze-nou, AUGUST, Count NEITHARDT VON (1760-1831). A Prussian field-marshal and one of the most prominent figures in the War of Liberation. He was born in Schildau, in Prussian Saxony, October 27, 1760. In 1777 he entered the University of Erfurt, and two years later joined an Austrian regiment. In the following year he entered the service of the Margrave of Ansbach-Bayreuth, and in 1782 went to America as an officer in the mercenary force raised by Great Britain in Germany. He returned, however, in the following year without having seen any actual fighting. In 1786 he entered the Prussian service as lieutenant of infantry. The next twenty years, with the exception of a year's active service in Poland in 1793-94, were spent in the quiet of garrison life. During this time, however, Gneisenau became a profound student of military and political history. In 1806 he took the field against Napoleon and fought at Saalfeld and Jena. He was raised to the rank of major, and was intrusted, in April, 1807, with the defense of Kolberg, which was invested by a large French army. With the aid of Schill and Nettelbeck he carried on a heroic resistance against the greatly superior forces of the French until hostilities were concluded by the Peace of Tilsit. For his services he was raised to the post of chief of engineers, and was made a member of the council to which was intrusted the task of reorganizing the Prussian State, which had exhausted its forces in the disastrous war against Napoleon and had been dismembered by the Peace of Tilsit. In this work of national revival he coöperated heartily with Stein and Scharnhorst,

and though primarily devoted to the problem of military reorganization, exercised considerable influence on the general policy of the Ministry. After Stein's dismissal he resigned (1809), owing to the hostility of Napoleon, and from 1811 to 1813 was intrusted with secret missions to Austria, Sweden, Russia, and England. Upon the outbreak of the War of Liberation in 1813, he became major-general in the corps of Blücher, and subsequently chief of staff to the Army of Silesia. In this position Gneisenau displayed remarkable strategic talents, a relentless energy, and a daring which contributed, in no small degree, to the success of the Prussian arms. He became lieutenant-general after the battle of Leipzig, and upon the return of Napoleon from Elba was made once more chief of staff under his old commander, Blücher. After the repulse of the Prussians at Ligny, June 16, 1815, he executed a skillful retreat, and to him was due, in large measure, the opportune arrival of the Prussians on the battlefield of Waterloo, June 18th. After the decision of the battle he led the pursuit, turning the French retreat into a complete rout. He was made Governor of Berlin in 1818 and field marshal in 1825. Soon after the outbreak of the Polish insurrection of 1830 he was assigned to the command of the Prussian corps on the Polish frontier, but he died at Posen, August 24, 1831. Gneisenau has assumed in Prussian history the dimensions almost of a national hero. He was with Stein, Scharnhorst, and York, one of the small band of patriots who, in the hour of Prussia's deepest degradation, never despaired of their country, and later, when an opportunity offered for overthrowing Napoleon, devoted themselves to the destruction of the hateful French domination. In Gneisenau, moreover, ardent patriotism was combined with a most lovable nature, marked by natural gentleness and refined by years of study and by travel. There is a monumental life of Gneisenau in five volumes by Pertz and Delbrück (Berlin, 1864-80); an abridgment of this was published by Delbrück in two volumes (Berlin, 1894).

GNEISS (Ger., probably connected with OHG. *gneista*, Icel. *gneisti*, AS. *gnást*, Eng. *gnast*, spark). A family of rocks belonging to the metamorphic series, and resembling granite in composition. Gneisses are granular aggregates of feldspar and quartz, with mica, hornblende, or pyroxene, and some of the rarer metals. Their structure is characterized by a parallel arrangement of the constituents: the light and dark minerals alternate in bands or layers, which are sometimes so regular and distinct as to give the appearance of stratification. Owing to this peculiarity, many geologists hold that they are metamorphosed sediments. There is conclusive evidence, however, that the parallel arrangement may be brought about in rocks of truly igneous origin, either as a result of movements of the constituents while the magma is in process of solidification, or by compression and shearing strains after the rock mass has solidified. Some gneisses, doubtless, have resulted from the metamorphism of sediments; but in such cases the proof is not based primarily upon the gneissoid character. Neither the igneous nor the sedimentary theory of origin is to be accepted for gneisses as a class, and each occurrence must be studied by itself. For this reason, geologists have come

to use the term gneiss in its structural sense, without implying anything further as to origin or constituent minerals. When it is desired to define the composition of a particular type, other rock names are united with the term; for example, granite-gneiss, syenite-gneiss, gabbro-gneiss, or granitic gneiss, syenitic gneiss, gabbroic gneiss. Gneisses are the most widely distributed of metamorphic rocks (q.v.), and are found underlying the earliest sediments in almost all parts of the world. Consult: Kemp, *Handbook of Rocks* (New York, 1900); Rosenbusch, *Mikroskopische Physiographie der Mineralien und Gesteine* (Stuttgart, 1896). See GEOLOGY.

GNEIST, gníst, RUDOLF VON (1816-95). A German jurist and statesman, born in Berlin, August 13, 1816. He was graduated from the University of Berlin, and while occupying the post of lecturer in the university practiced the profession of law. In 1844 he became professor extraordinary of jurisprudence, and in 1850 he resigned his position as assistant judge of the Superior Court to devote himself more exclusively to teaching. In 1858 he became a member of the Lower Prussian House, where he served till 1893. He was prominent as a Liberal in that body and in the Reichstag, of which he was a member from 1867 to 1884. Gneist was an active member of the Liberal opposition, and subsequently of the National Liberal Party, among whom his profound scholarship made him an intellectual leader. Several of his ablest works relate to the English Constitution, which he greatly admired, and which he studied and cited as a model in the discussion of German affairs. His first notable work was *Geschichte und heutige Gestalt der Aemter in England* (1857). Other important works of special interest to English students, and appearing in English translations, are: *Englische Verfassungsgeschichte* (1882) and *Das Englische Parlament* (1886). He also wrote *Der Rechtsstaat* (1872), and numerous other works on the history of jurisprudence and legislation. Consult Gierke, *Rudolf von Gneist* (Berlin, 1895).

GNESEN, gná'zen (Pol. *Gniezno*). A town in the Province of Posen, Prussia, capital of a circle of the same name, situated in a district abounding in hills and lakes, 31 miles east-northeast of Posen (Map: Prussia, G 2). Its old and noteworthy cathedral, begun in the tenth century, is adorned with fine paintings, bronze doors, and chapels, and contains the tomb of Saint Adalbert, who was bishop here. There are also an archiepiscopal palace, a theological seminary, and a gymnasium. The manufactures include machinery, lumber, sugar, and flour. Tradition fixes the year 550 as the date of the foundation of Gnesen, the oldest town in Poland. It became an archiepiscopal seat in 1000, and during the Middle Ages was for a time the residence of the Polish kings, who were crowned here until 1320. The archbishops of Gnesen were primates of the realm and acted as vicars during the frequent interregnums. Population, in 1890, 18,088; in 1900, 21,693, one-half being Poles.

GNETACEÆ, nê-tá'shâ-ê (Neo-Lat. nom. pl. from *Gnetum*, from Malay *gnemon*, *gnemo*, the native name). One of the great groups of gymnosperms, which comprises at present three genera, that differ remarkably in habit and habitat.

The genera are *Ephedra*, with about 30 species, from the arid regions of both hemispheres; the very peculiar *Tumboa* (*Welwitschia*), from the extremely arid regions of Western South Africa; and *Gnetum*, with about 15 species, from the tropics of both hemispheres. The species of *Ephedra* are low, straggling shrubs, with long-jointed and fluted green stems, and opposite, scale-like leaves connate into a two-toothed sheath. The body of *Tumboa* has the shape of a gigantic radish, which rises little above the surface of the ground, and whose crown is sometimes 12 to 15 feet in circumference. From the edge of the crown two enormously long, parallel-veined leaves arise, which extend upon the ground sometimes for 10 to 15 feet, and become split into numerous ribbons. This single pair of opposite leaves, the only pair produced, grows continually at the base, and lasts through the lifetime of the plant, which is said to reach more than a hundred years. The species of *Gnetum* are either small trees or woody climbers, and are among the prominent lianas of tropical forests. The foliage is leathery in texture and suggests dicotyledons, as the well-developed opposite leaves are lanceolate to ovate in outline and pinnately net veined. See Plate of GYMNOSEPERMS.

The group is of special interest to the botanist on account of the display of certain angiospermous characters that have suggested that *Gnetaceæ* may have given rise to the angiosperms; but such a theory has been abandoned by most morphologists. The characters that distinguish the group from other gymnosperms are the occurrence of true vessels in the secondary wood, and the presence of a so-called perianth. In addition to these two distinguishing characters, the group has the following four characters in common, but not peculiar to it: (1) Opposite leaves; (2) dicotyledonous embryos; (3) cauline ovules; and (4) no resin-ducts. Some fossil forms of plants referable to the *Gnetaceæ* have been found; the majority from Tertiary deposits seem to belong to the modern genus *Ephedra*. The stems and female flowers of a species of *Ephedra* are found commonly in finely preserved condition in the Tertiary amber of the Baltic provinces. Stems and leaves of still earlier age, resembling those of *Ephedra*, and hence called *Ephedrites*, have been obtained in the Jurassic rocks of Eastern Siberia.

GNOLI, nyô'lâ, DOMENICO (1839—). An Italian author, born in Rome. He attracted public attention by his volume of poems published under the pseudonym of 'Dario Gaddi,' and a collection of critical essays, *Odi Tiberine*. He was professor of Italian literature at Turin, and in 1893 was made prefect of the Library Vittorio Emanuele at Rome. He collaborated on the *Nuova Antologia*, and founded and was an editor of the *Archivio Storico dell' Arte*. His translations include the *Römische Elegien* of Goethe, and various other German classics. Many of his original essays were published in the *Nuova Antologia*. His other writings are: *E morto il re* (1882); *Canto dei pellegrini alla tomba del gran re* (1883); *Le opere di Donatello in Roma*; *Il banco d'Agostino Chigi*.

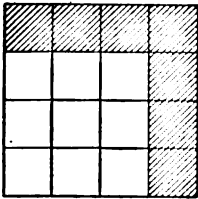
GNOME, nôm (Fr. *gnome*, apparently from Gk. γνώμη, *gnômê*, knowledge, or from γνώω, *gnôō*, one who knows, from γινώσκω, *ginôskō*, to know). A name given in the cabalistic

and mediæval mythology to one of the classes of beings which are supposed to be the presiding spirits in the operations of nature in the mineral and vegetable world. They have their dwelling within the earth, where they preside specially over its treasures, and are of both sexes—male and female. (See INCUBUS; KOBOLD.) The males are often represented in the form of misshapen dwarfs.

GNOME (Gk. γνώμη, knowledge, judgment, maxim). A short and pithy proverbial saying, often embodying a moral precept. Such have been common among nearly all nations at some period of their development; examples are plentiful in the Bible. In Greece the period when men began to express in a proverbial form general maxims of conduct was the age of the Seven Wise Men. The gnomic form of expression became also a characteristic of much of the lyric poetry of the period, and such poetry as had this characteristic was called at a later time *gnomic* (γνῶμικός). Lyric poets in whose verse this gnomic character prevailed or was prominent are Solon, Theognis, Phocylides, Simonides of Amorgus, and Xenophanes. There are editions of the gnomic poets by Brunck (Strassburg, 1817), Schäfer (1817), and Bergk, *Poetæ Lyrici Græci*, vol. ii. (4th ed., Leipzig, 1882). Consult also Opsimathes, Γνῶμαι; sive *Thesaurus Sententiarum et Apophthegmatum* (Leipzig, 1884).

GNOME OWL. One of the diminutive or 'pygmy' burrowing owls of the Western United States; especially *Glaucidium gnoma*. See BURROWING OWL.

GNOMON, νόμων (Gk. γνώμων, one who knows). The name given to odd numbers by Pythagoras. An odd number of the form $2n + 1$ was known to be the difference of two square numbers $(n + 1)^2$ and n^2 . This doubtless arose from the geometric conception of a gnomon as the difference between two squares or rectangles; e.g. take a square of side 3 (see figure) and extend its length and breadth one unit. The resulting figure is a square of area 16. The difference of these squares, $16 - 9$, or 7, represents an odd number or gnomon.



The term gnomon was also applied to a kind of sun-dial (consisting of a staff through the centre of three concentric circles), probably introduced into Greece by Anaximander (B.C. 610-546).

GNOSTICISM, νόσ'τι-σιζ'μ (from *gnostic*, from Lat. *gnosticus*, Gk. γνωστικός, *gnōstikos*, relating to knowledge, from γνώσις, *gnōstis*, knowable, from γινώσκω, *gignōskō*, to know). The name given to several more or less closely related speculative systems, which flourished in the Church of the second century. Like much of the philosophy of that time, the Gnostic systems were syncretistic, drawing their materials from Jewish, Christian, and pagan (Oriental) sources. They were cosmological rather than theological in character, their aim being to describe how the cosmic order was originally projected, then lost, and finally restored.

Knowledge appears among the 'spiritual gifts'

of the New Testament (I. Cor. xii. 8; xiii. 2), and Paul refers also to a 'hidden wisdom' (*σοφία*), which he ventured to use among the 'perfect' (I. Cor. ii. 6, 7). Such expressions as these make it easy to understand how the apostolic teaching might easily come to be regarded as esoteric, as was the case among some Gnostic sects in the second century. Even before the close of the New Testament we find warnings against a 'false' knowledge (I. Tim. vi. 20), which doubtless refers to some kind of Gnostic speculation already judged to be dangerous to the faith. Nevertheless, Gnostic ideas were long current within the Church, and often during the early period they were maintained without offense. Ignatius of Antioch, at the beginning of the second century, uses Gnostic language in speaking of Christ as the Logos of God, 'who proceeded from silence' (*Ep. to Magnesians*, 8). And in *II. Clement*, 14, we meet again with Gnostic terms, where the preacher says: "I do not suppose ye are ignorant that the living Church is the body of Christ, for the Scripture saith God made man male and female. The male is Christ, and the female is the Church." In other words, the Gnostics were Christian theologians, a fact which is forgotten by some who have attempted to describe them. Their form of religious thought was but one out of many tendencies in their time—a tendency, to be sure, diverging from the main line of development until at last it was pronounced heretical, yet whose history, until that time came, falls within, not without, the Church. Their leaders were persistent in maintaining that they drew their inspiration and authority from apostolic sources. So Valentinus traced his connection with Paul through one Theudas; Basilides with Saint Peter through Glaukias (*Clement of Alexandria, Stromata*, vii. 17). We learn from Epiphanius that Ptolemy declared he had the authority of 'apostolic tradition' for what he taught. In this respect the Gnostics pursued the same course as the ancient Catholic Church. But when Irenæus wrote his great work, *Against Heresies* (A.D. 180-90), the Church had already begun to distinguish between 'ordinary' (i.e. orthodox) Christians and Gnostics, whom Irenæus calls 'heretics.' We may therefore infer that about this time the exclusion of Gnostics from Church fellowship was beginning. After the close of the second century, whenever the claims of 'knowledge' are freely advanced and maintained by prominent writers (as, e.g. by Clement of Alexandria and Origen), it is a permissible Christian Gnosticism which they are describing and defending, not the Gnostic heresy which the Church had by that time rejected. To Clement the Christian is the only true Gnostic (*Stromata*, vii. *passim*).

In the almost complete absence of Gnostic literature, we are forced to rely upon its orthodox opponents for information concerning the heresy. Our most important witnesses are Irenæus, Tertullian, Hippolytus, and Epiphanius; but light is also cast upon its early forms by Ignatius and Justin Martyr. Gnostics were numerous after the end of the first century, and found in widely separated localities. (For the names of the leaders and sects, see GNOSTICS.) Their teachers differed from one another in details and in some important doctrines; nevertheless a remark made by Hippolytus in his account of the serpent-worshippers (*Refutatio*,

v. i.) might be applied to all Gnostics alike: "Their detached heresies are essentially one." All were practically agreed in holding some sort of dualistic theory of the world, that spirit and matter, good and evil, are essentially opposed to each other. Whatever comes in contact with matter shares in its contamination; therefore the supreme God cannot be the Creator of the world. Of the supreme God indeed hardly anything can be predicated. He (It) is wholly transcendent, utterly remote from all that we know as existing. We might even call Him (It) the 'Non-existent,' as does Hippolytus. From information given mainly by Irenæus in his work *Against Heresies* we are able to construct an outline of the teaching of Valentinus, from which the place occupied by the Creating God will appear in due course. At the two extremities of thought are transcendent Deity and the Void, or Emptiness (*κένωμα*). Between them there is no connection or communication. No world exists, nor is there any creative agency to produce a world. There is a series of divine beings, ideas, or powers, called *Æons* (*αἰῶνες*), which emanate in pairs from the First Cause, with diminishing dignity as they proceed. These *Æons* together constitute the *Pleroma* (*πλήρωμα*) or Fullness of divine existence, as over against the *Kenoma*, or great Void. They are endowed with sexual polarity, a masculine and a feminine appearing together; for example, *Nous* (*νοῦς*, mind) and *Aletheia* (*ἀλήθεια*, truth); *Logos* (*λόγος*, word or reason) and *Zoe* (*ζωή*, life). These names remind one of the Gospel of John, from which very likely they were derived. The total number is thirty, corresponding to the unknown and mysterious years of Christ's life, before he began his public ministry. They are arranged in groups of an Ogdoad, a Decad, and a Duodecad. One of the lowest and feeblest *Æons*, *Sophia* (*σοφία*, wisdom), rashly attempts to mount up to a union with the great First Cause, or Father of All, and thereby interrupts the order or equilibrium of the whole system, which is the Gnostic 'fall.' By a complicated process some sparks of divinity become entangled with their opposite, namely the great Void, and from the resulting confusion emerges the Creator, or Demiurge (*δημιουργός*, which suggests Plato's creating god), who proceeds to form the visible world, including man. He is the Jehovah of the Old Testament, the only God known to the Jews, but of course not the Supreme Being himself. The material creation, being more or less directly the consequence of an interrupted order, is itself by nature evil. And this evil quality, from which nothing material escapes, includes the human race.

The problem of redemption for the Gnostics was to restore the lost cosmic order, to remedy the evil caused by the weak and erring *Æon*, to liberate those sparks of Deity which had become entangled in the meshes of evil matter and in man. Christ is an instrument in the accomplishment of this task—Himself an *Æon* indeed, who was apparently joined with Jesus of Nazareth from the time of His baptism to His crucifixion. This union was *doctetic*, that is, only a seeming. The heavenly Christ did not in fact suffer or die, but left the man Jesus before His death on the cross. (See *DOCTÆ.*) Christ's office, so far as men are concerned, was to teach

the true 'knowledge,' to make Gnostics, to impart the secrets of that system to which He Himself belonged. The redeemed are those who can receive this esoteric teaching, and become free from the flesh. Their salvation is only an incident in the vast process of restoring the lost harmony of the *Pleroma*—a very different matter from the Christian idea of being saved from sin.

According to the ethical system of the Gnostics, all men are divided into three classes, according as they have, or have not, elements of deity within them: spiritual or pneumatic men (*πνευματικοί*); animal or psychic men (*ψυχικοί*); and carnal or physical men (*σαρκικοί*, *σωματικοί*). The Gnostics themselves constitute the members of the first group; they will be saved through their knowledge of the esoteric system and through their ascetic life. The third group are wholly material and cannot be saved, for their nature is evil; they have no single spark of the divine within them. In the intermediate class ordinary Christians are found, persons who have not the higher knowledge, yet who may possibly—at least some of them—be saved through faith (*πίστις*), which is vastly inferior to 'knowledge.' In the practical relations of life the Gnostics applied their principles in one of two ways. Although these seem diametrically opposed to each other, yet each was supported by an appeal to the logic of their principle that matter is essentially evil. Some said: The body, being composed of evil matter, should be denied in its every tendency and impulse—whence resulted asceticism. Others said: It may be indulged in every physical gratification and even abused through over-use—whence resulted libertinism and sensuality. All the nobler Gnostics adopted the ascetic life, and some of them pushed it to an extreme (as e.g. the Encratites). The opposite theory of self-indulgence was advocated and practiced by such sects as the Carpocratians and Marcosians.

The traces of Christian teaching in this system are manifest. But not less evident is the influence of Hellenic and Oriental speculation. Harnack has coined a phrase which is already proverbial (the 'acute Hellenizing of Christianity'), to describe the progress of Gnosticism. The attempt to Hellenize Christianity and explain away its doctrines in the light of the 'higher knowledge' was parallel to the line which heathen philosophers had taken with popular theology, which they admitted contained some manner of truth accommodated to the ignorance of the multitude. So Gnosticism would admit the necessity of faith for the vulgar multitude, but reserved the 'higher knowledge' for the few who were fitted to receive it. This knowledge was superior to and independent of the faith. The central idea of Gnosticism made it welcome to many who were half converted from Heathenism. The æsthetic instinct, which was the soul of Greek and Roman culture, revolted at the authority of the Church, which imposed the same belief on all, and exacted the same submission from philosopher and slave alike. In a system of compromise like Gnosticism, it escaped this ignominy.

In the course of the Gnostic controversy the Church defined her theory of the ancient Catholic standards, as the tests of orthodoxy, viz. the rule of faith, the canon of Scripture, and the episcopate, each of these being regarded as of

apostolic origin and authority. Upon them she relied not only for vindicating the truth of her doctrine and the sole validity of her practice, but also for proving the falsity of her opponents' position. With these standards once generally recognized, the Gnostics, who were in the minority, could be, and were, shut out from Christian fellowship. This development was under way long before the close of the second century, and was practically complete in the age of Cyprian (c.250 A.D.), when Gnosticism had already become a negligible factor. In fact, after Marcion in the middle of the second century, Gnosticism is of little practical importance, though its tendencies reappear in the Manichees and Manichæan sects of the Middle Ages.

GNOSTIC WRITINGS. Basilides's twenty-four books on the Gospel, entitled *Exegetica*, have for the most part perished, along with other early heretical works, but we have some quotations from them in the early Christian literature. There is at present no way of verifying Origen's statement that Basilides wrote a gospel of his own, nor have we the *Gospel of Truth*, which Irenæus attributes to the Valentinians. The *Letters*, *Homilies*, and *Psalms* of Valentinus have likewise perished. Fragments have come down to us from the works of Bardesanes, a Christian poet of Syria (died after A.D. 220), who is sometimes classed among the Gnostics. In the *Pistis Sophia* we possess an Egyptian Gnostic writing of the third century, preserved in Coptic, relating the history of Wisdom in the form of a dialogue between the risen Christ and His disciples. Here asceticism is put forward as a Christian duty, and we find something closely akin to the sacramental theory of penance. Other valuable Coptic versions of Gnostic works have recently been discovered by Carl Schmidt. Epiphanius preserves for us a letter from the Valentinian Ptolemy to Flora. There are several books of Gnostic *Acts*, bearing the names of Peter, John, Thomas, and Andrew, which appear to have been circulated in a collection which passed under the name of one Leucius.

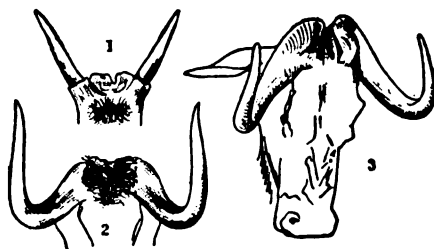
BIBLIOGRAPHY. On the literature of Gnosticism, consult: Harnack-Preuschen, *Geschichte der altchristlichen Litteratur* (Leipzig, 1893); Krüger, *History of Early Christian Literature* (New York, 1897); Mead, *Pistis Sophia*, translation (London, 1896); Lipsius, *Der Gnosticismus* (Leipzig, 1860); King, *The Gnostics and Their Remains* (2d ed., London, 1887); Mansel, *The Gnostic Heresies of the First and Second Centuries* (London, 1875); Hilgenfeldt, *Ketzergeschichte des Urchristenthums* (Leipzig, 1884). The most important attacks upon the Gnostics may be read, in English, in the *Ante-Nicene Fathers*, ed. by Cox (10 vols., New York, 1885-96). In general, consult: Harnack, *History of Dogma*, vol. i. (London, 1894); Rainy, *The Ancient Catholic Church* (New York, 1902). See BASILIDES; CARPOCRATES; CERDONIANS; CERINTHUS; DOCETÆ; ENCRATITES; HERACLEON; MARCION; NICOLAÏTANS; OPHITES; SETHITES; VALENTINIANS.

GNOSTICS. Those who adhered to the early heresy known as Gnosticism. From the end of the first century onward for two generations Gnostic heretics were many and widely scattered. "A multitude of Gnostics have sprung up, and have shown themselves like mushrooms growing

out of the ground," says Irenæus. Among them all we may distinguish two main types, a Jewish and a Greek. Cerinthus and Menander are the most famous early representatives of the former, and among the many sects of Jewish origin or affiliation the Nicolaitans, Sethians, Cainites, and Ophites (serpent-worshippers) may be mentioned. Cerinthus and Menander were earlier in point of time than the great Gentile leaders, but their systems played a much less important part in history. Among the more influential Gentile Gnostics were Carpocrates, Saturnilus, Cerdo, Basilides, Valentinus, Isidore, Heracleon, Ptolemy, and Julius Cassianus. Saturnilus (or Saturninus, as he is sometimes called) represents the Syrian school, to which Tatian and the ascetic sect of the Encratites are in a measure related. Basilides and Valentinus are the masters of the Alexandrian Gnostics, the school which was by far the most important, and about which we have the fullest information. Basilides taught in the time of Hadrian. Valentinus went from Alexandria to Rome, where he labored (c.140-160 A.D.) and founded a church. Marcion, of Pontus (q.v.), while resembling the Gnostics in some of his teachings, is hardly to be regarded as one of their number. See GNOSTICISM, and the articles on the Gnostic teachers and sects.

GNOTHO, nō'thō. An aged bumpkin, in Massinger, Middleton, and Rowley's play *The Old Law*. He tries to take advantage of an antiquated legal quibble to get rid of an old wife and marry a new one.

GNU, nū (from Hottentot *gnu, nyu*), or WILDE-BEEST. A member of a remarkable genus (*Connochetes*) of African antelopes, of which the best-known species has been formerly described as made up of parts of an antelope, a buffalo, and a horse. The grotesque appearance of some species suggests this composite. (See Plate of ANTELOPES.) The gnus form a genus of large, ungainly animals, having horns in both sexes, and the withers higher than the haunches. The body and legs are antelope-like, but the head is so massive and broad as to resemble that of an ox. The



HORNS OF GNU.

Showing development from the yearling (1) through youth (2) to maturity (3) in the white-tailed guu.

muzzle is naked, the eyes are small, with a gland beneath each, whence sprout long, stiff hairs, and the horns, which in old age form a helmet over the forehead, are broad, black, and shaped like an African buffalo's, to which must be added the bovine-like circumstance, not present elsewhere among antelopes, that the horn-cores are honey-combed with cavities. Long hairs bristle about the chin and throat, and a stiff mane is borne upon the arched crest of the neck; while the tail

is profusely hairy, like that of a horse, and sweeps the ground.

There are two species. The once 'common' gnu, or white-tailed wildebeest (*Connochetes gnu*), formerly roamed all over South Africa, but by the end of the nineteenth century had become so scarce as to be extinct except in the remoter districts; its dependence upon water denied it the desert, which has been the means of preserving some of its former associates. In this species long hair fringes the chest, and the color is uniformly deep brown, with the tail white. In the other species, the brindled gnu or blue wildebeest (*Connochetes taurina*), whose habitat was north of the Zambezi, wherever plains extended, the chest has no long hair, the tail is black, and the general color duller, and marked with dark vertical stripes upon the shoulders and neck. The former stands about four and a half feet high; the latter is somewhat larger. The females of both are lighter in hue than the males.

Gnus went about in bands of thirty or forty, and were fond of associating with quaggas and zebras, whose actions their own resembled. The old bulls were extremely watchful, and usually the first to discover danger and give the alarm. See ANTELOPE; and Plate of ANTELOPES.

GOA, gô'â. A Portuguese colony on the Malabar coast, India, extending from latitude 14° 54' to 15° 45' N., and from longitude 73° 45' to 74° 26' E. (Map: India, B 5). It is 60 miles long by 30 miles broad, and contains an area of 1080 square miles. It has been a Portuguese possession since its conquest by Albuquerque in 1510. Population, in 1891, 561,400. Capital, Panjim.

GOA. A city on the Malabar coast, India, in latitude 15° 30' N. and longitude 74° E., the former capital of the Portuguese dominions in India (Map: India, B 5). It was once a city of great magnificence with 200,000 inhabitants, and important chiefly on account of its harbor, one of the best on the west coast, from which it was about three miles distant. Its decline was due to the ravages of cholera in the beginning of the eighteenth century, when most of the Portuguese left it, and settled nearer the harbor of Panjim, or New Goa, which is the present seat of the colony, with a population of about 8500. The old city is the see of an archbishop, the primate of the Portuguese Indies, and contains an imposing cathedral, besides many interesting ruins. Panjim, on the Mandavi River and connected by the Portuguese West India Railway (51 miles) with British India, is a clean and picturesque town, with a good modern harbor, viceregal palace, college, and public library. Rice, cocoanuts, and spices constitute the chief products and exports. For a description of ancient Goa, consult Marryat, *Phantom Ship* (London, 1839).

GOA. A gazelle (*Gazella picticaudata*), inhabiting the highest pastures of the Thibetan plateau, and having a very heavy coat of hair in adaptation to its cold habitat.

GOA CEDAR. See CYPRESS.

GOAJIRA, gô'â-hê'râ. A peninsula of South America, forming the most northern part of the continent. Its area is estimated at over 5000 square miles (Map: Colombia, C 1). The coasts are mostly sandy and low, while the interior contains a number of mountains. It is sparsely watered, and the chief occupation of the inhab-

itants is cattle-breeding. Its people are semi-independent Indians, known under the name of Goajiros, and variously estimated at from 30,000 to twice that number. The peninsula was formerly divided between Venezuela and Colombia, but by the decision of 1891 it was awarded to the latter.

GOAJIROS. An Arawakan tribe of the Goajira Peninsula, on the northwest of Lake Maracaibo, South America. This most interesting tribe build their houses in the Maracaibo and other lagoons of Venezuela, driving piles into the mud, and erecting on them oblong rectangular dwellings with high-pitched roofs. The structures are thatched, and have on one or more sides platforms on which cooking and the family occupations are carried on in open air, and which also serve as landing-places for canoes. The name Venezuela, or little Venice, originated from the prevalence of these structures over the water. The people subsist by fishing, agriculture, and on the natural fruits, nuts, and roots of this bountiful region. They are expert in weaving cotton and palm textiles, and make beautiful featherwork.

GOA POWDER, ARAROA, or CRYsaroba. A drug imported in the form of a yellowish or chocolate-colored powder. The name Goa powder is derived from the Portuguese colony of Goa, where the drug appears to have been introduced about the year 1852. It was exported from Bahia to Portugal, whence it found its way to the Portuguese colonies in Africa and Asia. The tree which yields it (*Andria araroba*) is met with in great abundance in certain forests in the Province of Bahia, Brazil, preferring low and humid spots. It is from 80 to 100 feet high, and is furnished with imparipinnate leaves, the leaflets of which are oblong, about one and a half inches long and three-quarters of an inch broad, and somewhat truncate at the apex. The flowers are papilionaceous, of purple color, and arranged in panicles. The Goa powder, or araroba, is contained in the trunk, filling crevices in the heart-wood. To obtain it the oldest trees are selected as containing the larger quantity, and after being cut down are sawed transversely into logs, which are split longitudinally, and the araroba chipped or scraped off with the axe. During this process the workmen feel a bitter taste in the mouth, and great care has to be taken to prevent injury from the irritating action of the powder on the eyes. In this state, i.e. mixed with fragments of wood, the Goa powder is exported. It is used in the form of an ointment made by rubbing together forty grains of the powder, ten drops of acetic acid, and an ounce of lard. It is used in several skin diseases, especially in ringworm and psoriasis; and it owes its efficiency to the chrysophanic acid it contains.

GOAR, gô'âr', SAINT (?-575). A mediæval missionary, born in Aquitaine. According to the legends concerning him, he went to Oberwesel, Germany, in the reign of Childebert (511-58), where he erected a chapel at a point since called Saint Goar. He devoted himself to the propagation of Christianity, and is said to have made numerous converts. He was buried in the chapel built by him, and the monastery subsequently erected there became a chapter-house in 1127. In 1768 the celebrated Church of Saint Goar on the Rhine was dedicated to him.

GOAT (AS. *gāt*, Icel. *geit*, OHG. *geiz*, Ger. *Geiss*; ultimately connected with Lat. *hædus*, kid). A genus (*Capra*) of ruminant quadrupeds of the family Bovidae, so closely allied to the sheep that it is not easy exactly to define the distinction, although the common domestic goat and sheep are of widely different appearance. One of the most marked of the distinguishing characters is that the horns of goats, present in both sexes, but smaller in the females, are long, and directed upward, backward, and outward, while those of the sheep are more or less spirally twisted. Other characteristics are the beard on the chin of the male goats, which is wanting in the sheep, and the straight line of the face in goats, as compared with the arched line in sheep. The tail of goats is also much shorter than that of sheep. A constant mark of distinction is the absence in goats of a small pit between the toes of the hind feet (in some cases of all four feet), producing a fatty secretion, which exists in sheep, and is peculiar to them. And another constant mark which is absent in sheep is the strong smell of male goats, particularly during the rutting season. Equally constant are the differences of temper and manners, goats being in a high degree curious and confident.

WILD GOATS.

True wild goats, of which some ten species are recognized, belong to the Old World alone, where they are confined to the mountainous region which extends from the Atlas ranges of Northwestern Africa to Central Asia. Some other animals called goats are zoologically otherwise related. All are essentially mountain animals, and exhibit a great aptitude for scrambling among rocks and bushes, are extremely sure-footed, and display great strength and agility in leaping. They also prefer as food the leaves and small branches of shrubs, and the strongly aromatic herbs which abound in mountainous localities, to the herbage of the richest pastures, browsing rather than grazing, as do sheep. They live in small herds, but the old bucks are likely to live separately, and thus serve the purpose of scouts, though all are extremely wary, and hence are among the most difficult of game for the sportsman. Two kids are usually produced at birth, in late spring, and very quickly become able to travel with the band.

The best-known as well as most characteristic species of wild goat is the bezoar goat, or pasang (*Capra ægagrus*), which was once common throughout the Grecian Archipelago, but now is known only in Crete and one or two other islands, and thence eastward through the highlands of Asia Minor to Persia, and thence to Northeastern India. It inhabits all barren hills in the East, but in Persia rarely descends much below the timber-line. This goat (see Plate of WILD GOATS, ETC.) stands about 36 inches high, and in winter is brownish gray, changing in summer to a more reddish-yellow tint, with the buttocks and under parts nearly white; and the older bucks have the forehead, chin, beard, throat, front of the legs, a stripe along the spine, the tail, and a band on the flanks dark brown. The horns of the old bucks measure 40 to 50 inches along the curve, rise close together from the top of the skull, and sweep backward in an even curve, with the front edge forming a strong keel marked by irregular prominences; the horns of the female are much smaller and

smoother. The old bucks maintain a most vigilant watch, one or more being constantly on the lookout and warning the herd of danger. This is the species from which domestic goats have been derived. An illustrated account of this species will be found in the *Proceedings of the Zoological Society of London for 1875*, by C. G. Danford.

GOATS OF THE CAUCASUS, OR TURS. Three kinds of wild goats, distinguished as species, but perhaps only varieties of a single race, inhabit the Caucasus range, which in form and color much resemble the pasang, though somewhat paler as a rule, and with long reddish-brown beard and short scut. Their horns, however, are very different, being very massive, smooth, and black, with a squarish cross-section at the base, and sweeping outward and then inward, with a tendency toward a spiral, best shown in the Western or Severtzow's tur (see Plate of WILD GOATS, ETC.), which more nearly approach the form of the ibex's. The eastern Caucasus is inhabited by Pallas's tur (*Capra cylindricornis*); the central parts of the range, between Mount Elburz and Daghestan, by the Caucasian tur (*Capra Caucasica*); and the western part by the larger, more ibex-like Severtzow's tur (*Capra Severtzovi*).

THE SPANISH GOAT. Closely allied to the turs is the wild goat or 'cabramontes' (*Capra pyrenaica*) of the mountains of Spain and Portugal. It is a smaller animal than the others, bucks standing about 26 inches in height, with horns measuring 25 to 28 inches in length. Its horns are divergent, tend to be spiral, are somewhat triangular in section, with a strong keel on their posterior border, and knobs along the outside. These goats are so wary and resourceful that they remain numerous.

IBEX. All wild goats are frequently spoken of as ibexes, but the term should properly be restricted to four species of *Capra* dwelling upon the higher mountains of Southeastern Europe, Syria, Arabia, Abyssinia, and in the Himalayan region. They have long, knobbed, scimitar-like horns. See IBEX.

THE MARKHOR. This is a large wild goat (*Capra falconeri*) of the western Himalayas, distinguished by its high, upward-reaching flattened and spirally twisted horns. (See Plate of WILD GOATS, ETC.) It is found from Central Afghanistan to the sources of the Indus, and in this area exhibits several well-marked local races, in some of which the horns are much less twisted than in others, the longest measuring (along the curve) fifty inches. Its habitat ranges from barren foothills to the edge of the snow, and includes much rocky forest land; the country, therefore, is always an exceedingly difficult one to hunt in, besides which the animals are wonderfully keen and watchful. Nevertheless kids are captured from time to time, and are found to thrive well in captivity and to interbreed with domestic goats. The markhor is larger than other goats, and is distinguished by the great black beard of the old bucks, which covers the whole throat and breast with a mat of long hair, which also forms a heavy ruff around the shoulders. The remains of a goat closely resembling the markhor have been found in the Pliocene strata of India.

THARS AND GOAT ANTELOPES. There exist in Southern Asia three species of goat which have no beards and small horns, and are assigned to a separate genus, *Hemitragus*, the thars; one is

known to Anglo-Indian sportsmen as 'Nilgiri goat.' For an account of this genus, see THAR.

Intermediate between the goats and the antelopes stand several genera and species of mountain-loving animals, including the goral, cambingutan, serows, takin, chamois, and our American white goat. For these, see their names and GOAT ANTELOPE.

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DOMESTIC GOATS.

It is probable that the native Asiatic goats were among the first animals brought under the subjection of man, and there is no doubt that the main stock of those now in domestication was derived from the Persian pasang (see above). They must have been of peculiar value to the early nomadic men of Southeastern Asia, since they could pasture on the scanty herbage and bushes of the rocky mountains and plateaus, and move anywhere their masters went with even greater facility, conditions which domestic sheep could not well endure.

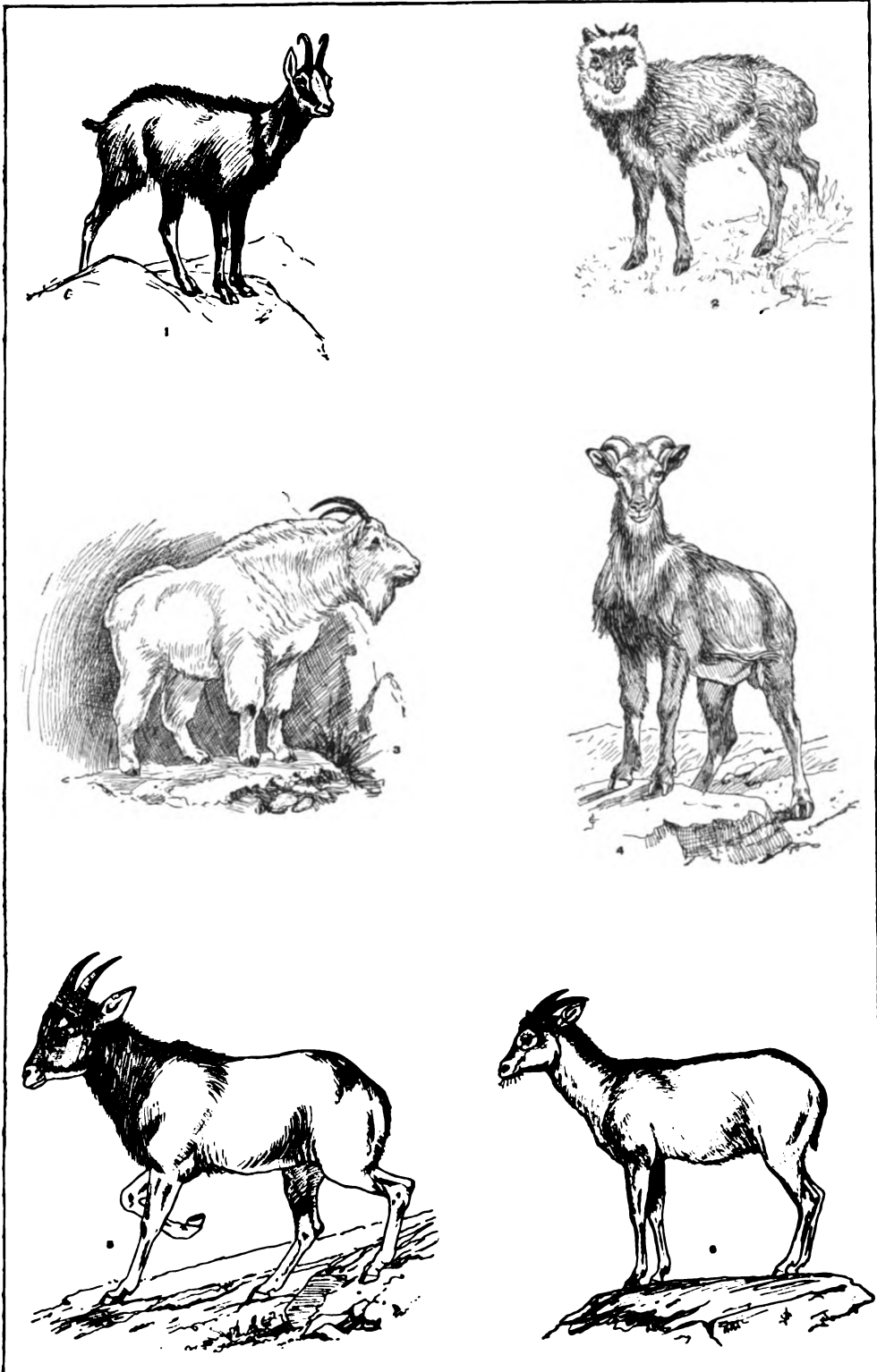
The varieties of the domestic goat are too many for treatment here, where only the most important can be mentioned. Those of Europe present many diversities of coat and form of horns, and distinguishable breeds are found in Ireland, Wales, and Norway, but no kind has the pendulous ears frequently seen in Asia, except a cream-colored breed peculiar to the island of Malta, whose ears hang below the jaw. This goat and some Spanish breeds are frequently hornless. More distinctive breeds exist south and east of the Mediterranean. Thus the 'guinea' goats, kept in enormous flocks by the natives of the Sudan and of the Niger Valley, are rather small, short-legged, short-haired, and usually dark in color, black and red prevailing. The horns are only three or four inches long, and curve forward at their tips; and the black beard is continued downward to spread over the shoulders and fore legs, suggesting some possible ancestral cross with the aoudad (q.v.). The Nile Valley and Egypt have a different goat, in which the legs and horns are longer; the profile is very convex, the horns crumpled, and often absent, and there is no beard. The short coat is usually reddish or bluish gray, more or less spotted, and the pendent ears are about as long as the head, flat, and round at the ends. The goats of Syria, Turkey, and Southwestern Asia, on the other hand, are large and tall, with the hair long, black, and silky, prominent curving horns, a small beard in both sexes, and the ears hanging for half their length below the jaw. These are sometimes called mamber or Kurd goats, and are the common stock of the country. In Asia Minor, however, there has existed, from immemorial times, a remarkable breed known as mohair or Angora goats, which merit particular description, since lately they have been sedulously cultivated in various other countries, including South Africa and the United States.

THE ANGORA GOAT. Various types of Angora goats have arisen in Asia Minor and Turkey dur-

ing the last half-century, owing to unwise crossing with the common Kurd stock. The pure-bred Angora was originally a small, exceedingly delicate animal, with small, thin horns, suggesting by their spiral form descent from the wild markhor. It was clothed with "dazzling white, fine, soft, silky, very lustrous mohair, curling in ringlets from 10 to 18 inches long." The continual crossing and re-crossing it has undergone has resulted in an animal much larger and more hardy. The type now approved in the United States (see Plate of WILD GOATS) is strongly built, with a straight horizontal back, short and strong legs, the head like that of a common goat, but less coarse, and the horns heavy, with an inward twist. "Except the face and legs, from the hocks and knees down, the entire animal should be covered with mohair. Both the belly and throat and even the lower part of the jaws should have a covering of fine, silky mohair in long, curly ringlets." These goats were introduced into the United States by a gift of nine from the Sultan of Turkey in 1849. Little increase followed, and all disappeared during the Civil War. Other importations were occasionally made until 1881, when the Sultan prohibited any exportation of the animals. Several were, nevertheless, obtained for California breeders in 1901. Angoras were scattered through the Southern States, but their raising and keeping did not become an industry until recently, when large flocks were produced on the Pacific Coast, especially in Oregon, and they have been successfully introduced in Iowa and Missouri. So promising have been these experiments that an extensive culture of this breed all over the United States, as well as in southern South America, is expected; and two clubs for the encouragement of the industry and the registry of blooded stock were organized in 1900. It is claimed for the Angora goats that they are among the most useful of domestic animals in a variety of ways. "The fleece, called mohair (q.v.), furnishes some of the finest of fabrics among ladies' goods, and is used in various other manufactures; their habit of browsing enables the farmer in a wooded locality to use them to help in subjugating the forest; their flesh is exceedingly delicate and nutritious; the milk, though not so abundant as with the milch breed of goats, is richer than cow's milk; their tanned skins, though inferior in quality to the skins of the common goat, are used for leather; their pelts make the neatest of rugs and robes; they are excellent pets for children; a few of them in a flock of sheep are a protection from wolves and dogs; their manure is noticeably helpful to the grass, which follows them after they have cleaned away the underbrush." A pamphlet was issued by the United States Department of Agriculture in 1901, containing an account, with illustrations, of the breed, and its qualities and products, and full directions as to feeding, care, shearing, etc. See *Bibliography*.

Goats otherwise have never taken a serious place in the farm property of the United States. The latest agricultural statistics enumerate only 45,500 in the whole country—a number exceeded by such small countries as Cape Verde Islands, and Senegal. The great bulk of the goats in the world, estimated at 36,000,000 in 1893, and 32,000,000 in 1896, are to be found in the south of Europe, in Syria, and in Northern Africa. **ALL**

GOAT-ANTELOPES



1. EUROPEAN CHAMOIS (*Rupicapra tragus*).
2. JAPANESE SEROW (*Nemorhaedus crispus*).
3. WHITE GOAT of Rocky Mountains (*Oreamnus montanus*).

4. THAR or HIMALAYAN GOAT (*Hemitragus jemlicus*).
5. HIMALAYAN SEROW (*Nemorhaedus bubalinus*).
6. HIMALAYAN GORAL (*Cemas gor.*).

the rest of the world together possesses scarcely a fifth of the total, and goats are almost absent from English-speaking countries the world over.

THE CASHMERE OR SHAWL GOAT. Nowhere have goats, other than Angoras, received more attention or been brought to a higher usefulness than in India, where a long list of varieties might be named and described, such as the streaked 'naga' of Assam; the 'bukee' of the Deccan, the 'maycay' of Mysore, etc. None of these equal in importance, however, those of the western Himalayan region, which are cultivated for the sake of their wool, of which the genuine Cashmere shawls are made. Two principal varieties of these are distinguished—the lesser, or chappoo, and the more common *changra* or 'shawl goat.' This variety is rather small, of various colors, but generally silvery white, with long, flattened, spiral horns, and pendent ears. These goats are valued not for the long outer hair, but for the underwool or *pashm*, which in summer is combed out and appears like grayish down. It is beautifully fine, soft, and silky, and from it are made the famous and often extremely costly shawls of Kashmir and its neighborhood. These goats were introduced into France and Germany during the last years of the nineteenth century, and have thriven well. Their natural home extends through Tibet through the mountains southwestward to the country of the Kirghiz, and enormous flocks are pastured by the natives in the high Himalayan valleys.

For the 'Rocky Mountain goat,' see **ROCKY MOUNTAIN WHITE GOAT**.

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GOAT ANTELOPE. A term applied by zoölogists to a group of ruminants having characteristics that join them to the goats on one side and the antelopes on the other; most of them, individually described elsewhere, have a more or less goat-like build, goat-like teeth, short tails, relatively small cylindrical horns, and no beards. The group includes the genus *Cemas* of the Himalayan region (see **GOBAL**); the genus *Nemorhædus* of Southeastern Asia, including the cambing-utan of Sumatra, etc. (see **SEBOW**); the Tibetan genus *Budorcas* (see **TAKIN**); the genus *Rupicapra* of the European Alps (see **CHAMOIS**); and the genus *Oreamnus* or *Haploceros*, which contains the white, woolly goats of Northwestern America (see **ROCKY MOUNTAIN WHITE GOAT**). See **Plate of GOAT ANTELOPES**.

GOATFISH, or SALMONETE. A marine fish of the genus *Upeneus*, closely related to the surmullets, many species of which exist in tropical American waters, and are used as food, as well as admired for their gaudy beauty. The red goatfish is *Upeneus maculatus*; the yellow is *Upeneus martinicus*. Both are common at Key West, Fla., and in the West Indies.

GOAT ISLAND. An islet of 80 acres on the verge of Niagara Falls, dividing the current where it plunges over the precipice. It is joined to the American shore by a bridge.

GOAT-LOUSE. A biting louse of one or more species of the genus *Trichodectes*, parasitic in the hair of goats. Several species are known in

various parts of the world, most widely *Trichodectes climax*. The species commonly troublesome on the Angora or mohair goats is regarded by some entomologists as peculiar to that animal, and is named *Trichodectes limbatus*. Consult Osborn, "Insects Affecting Domestic Animals," in *United States Department of Agriculture, Division of Entomology, Bulletin 5* (Washington, 1897).

GOAT-MOTH. One of the largest of European moths (*Cossus ligniperda*), measuring 3 to 3½ inches across the expanded wings, and brown, with various streaks and mottlings. In Great Britain the long, flat, hairy, yellowish caterpillar is called the auger-worm, and wanders about in search of some suitable tree into which to bore a tunnel. It feeds upon the excavated wood more than three years, then spins at the extremity of the tunnel a very tough cocoon formed of wood chips glued together by a gummy secretion, in which a small aperture is left for the admission of air. The adults have no proboscis, take no food, are very short-lived, and take their name from the goat-like odor they exhale. Congeneric species dwell in the United States.

GOAT'S BEARD. See **SALSIFY**; also **SPIRÆA**.

GOAT'S-RUE. See **REST-HARROW**.

GOATSUCKER. The common European nightjar (*Caprimulgus Europæus*), known anciently as 'caprimulgus' in Italy and 'aigothelas' in Greece, and which stands as the representative of a large cosmopolitan family of wide-gaped, nocturnal, moth-catching birds, the *Caprimulgidae*. The name is due to an immemorial popular belief that this bird milks goats. The notion probably arose from the habit of these birds of seeking insects, usually at dusk and near the ground, in pastures with domestic animals. Their strange leaping motions and great mouth would easily lend themselves to the construction of such a tale among primitive folk, and it retained life by reason of its picturesqueness until it became established in the early books. As the great body of the family have never been accused of goat-milking, it seems better to forget the erroneous old name and call these birds 'nightjars,' in reference to the vibrating cries many of them utter after dark. See **NIGHTJAR**.

GOBAT, gô-bâ', SAMUEL (1799-1879). An English missionary, born at Crémone, in Switzerland. In 1826, after studying at the Mission House in Basel, and learning Arabic, Æthiopic, and Amharic, he started as a missionary of the English Church Missionary Society to Abyssinia. But he and his companion, Christian Kugler, got no farther than Cairo until 1829, when they went to Gondar, and met with much success. But in 1832, after Kugler's death and the beginning of hostilities, Gobat left the country. When he returned in 1834, he was too sick to work, and in 1835 went to Europe again. In 1839 he went to Malta, worked on the Arabic Bible, had charge of the presses there, and in 1845 was director of the Protestant College. A year afterwards he was appointed by Friedrich Wilhelm IV. of Prussia to the See of Jerusalem. There he did a great work, especially in his orphan schools, and in the hospitals at Jerusalem, Bethlehem, Joppa, and Nazareth. His experiences in Abyssinia are described in *A Journal of Three Years in Abyssinia* (1847; in French in Paris, 1834). Con-

sult Schölby, *Samuel Gobat, evangelischer Bischof in Jerusalem* (Basel, 1900).

GOBLE, JUSTICE. A typical bully of the 'bench,' in Smollett's satire *The History of Sir Launcelot Greaves*.

GOB'BO, IL. See SOLARI, CRISTOFORO.

GOBBO, LAUNCELOT. A quaint, shrewd clown, in Shakespeare's *Merchant of Venice*, at first a servant to Shylock, whom he afterwards deserts for Bassanio.

GOBELIN, gô'blân'. A family of French dyers, originally from Rheims. GILLES and JEAN GOBELIN (c. 1450) set up a dyeing establishment in the Faubourg Saint Marcel, Paris, on the edge of the Bièvre. Thè son of Jean and his descendants added to the family fortunes. After a while they gave up their business and bought titles, but kept the name of Gobelin. Henry IV. procured a portion of the family property for some tapestry-makers, and in 1662 Louis XIV. established the manufacture of the "Meubles de la couronne" in one of the old Gobelin houses, which gave the name to the wonderful tapestries afterwards produced there. See TAPESTRY.

GOBE-MOUCHE, gôb-môosh' (Fr., gaping-mouth). Originally the name of a certain species of birds termed fly-catchers. In its transferred use it refers to a person who has no opinion of his own, or to one who is generally idle.

Gobi, gô'bê, or SHAMO, shâ'mô. A vast desert region of Central Asia, constituting the eastern extension of the arid belt that stretches across the whole breadth of the Asiatic continent into Africa (Map: Asia, K 4). As generally defined, it includes only the desert area of Mongolia from the confines of Sin-kiang on the west to the Khingan Mountains on the east, although some geographers extend its western limits to Lob Nor, in about longitude 90° E. Beyond the Khingan range is a smaller arid region, commonly called the Eastern Gobi. The Gobi has the form of a great plateau, whose surface, lying 3000 feet or more above the sea, is divided into dreary wastes of sand, rocky tablelands, and mountains. The climate is severe, especially on the borders, and the rainfall scanty; the precipitation being generally sufficient, however, to furnish pasturage for flocks and herds during the summer months. Most of the nomadic tribes inhabiting the interior are Buddhists. The permanent settlements are confined to the northern part, which is traversed by spurs of the Tian Shan, Altai, and Yablonoi Mountains. A number of caravan routes lead across the desert from China proper to Siberia. Some allusions to the Gobi Desert are found in the writings of Marco Polo, but the first definite information we owe to the Jesuit Gerbillon, who made several journeys across the country in 1688-98. It was later visited by the Dutchman Ysbrand Ides, in 1692-94, and twice (1727-28 and 1736) by Lorenz Lange, who was sent by the Russian Government to Peking. The most accurate and valuable information about the desert was obtained by explorers in the last fifty years, especially by Przhevalski and Sven Hedin (qq.v.).

GOBINEAU, gô'bê'nô'. JOSEPH ARTHUR, Count de (1816-82). A French Orientalist, born at Bordeaux. He held various diplomatic positions in Europe, and represented France at Athens

(1868), at Rio de Janeiro, and Stockholm. His works include: *Trois ans en Asie* (1859); *Les religions et les philosophies dans l'Asie centrale* (1865); *Traité des inscriptions cunéiformes* (1864); and *Histoire des Perses* (1869).

GOBLET, gô'blâ', ALBERT JOSEPH, Count D'ALVIELLA (1790-1873). A Belgian general, born at Tournai. He fought at the battle of Waterloo, and was Minister of War after the Revolution of 1830, which post he exchanged in 1832 for the Ministry of Foreign Affairs. From 1837 to 1839 he was Ambassador to Portugal, where he became exceedingly popular as adviser to the young Queen, Maria da Gloria, from whom he received the title of Count d'Alviella. He was Minister of Foreign Affairs from 1843 to 1845, and exercised a considerable influence upon the public measures advocated in the Chamber. As a military engineer he planned the defenses of Northern Belgium and the extension of the fortifications of Antwerp. His principal publications are: *Des cinq grandes puissances de l'Europe dans leurs rapports politiques et militaires avec la Belgique* (1863), and *Dix-huit mois de politique* (2 vols., 1865).

GOBLET, RENÉ (1828-1905). A French statesman. He was born at Aire-sur-la-Lys, studied law, and practiced with great success at Amiens. Already distinguished for his democratic principles expressed in his paper, the *Progrès de la Somme*, at the fall of the Empire he became procureur-général at the Court of Amiens. In 1871 he was elected to the National Assembly, where he joined the Republican Left and was soon recognized as an orator of rare ability. In 1879 he was appointed Under Secretary of State for Justice. In 1876 he failed of reelection to the Chamber, but in 1877 and in 1881 he was again returned from Amiens, and in 1882 was appointed Minister of the Interior; but in the crisis brought about by the Egyptian question, and because of the attacks made upon the Ministry of Freycinet, he, with the other members, resigned. In 1884 M. Ferry was overthrown and M. Goblet was appointed Minister of Education and Public Worship in the Brisson Ministry (April, 1885), in which position he energetically continued his reform policy. He retained his portfolio in the Freycinet Cabinet, which went out of office in 1886, when he became Prime Minister. His Ministry, however, was overthrown in May, 1887, because of his unpopular efforts toward radical change in the municipal organization of Paris. In April, 1888, Goblet took the portfolio of Foreign Affairs in the Floquet Cabinet, but resigned with the former in February, 1889. He was elected Senator in 1891, and as such warmly supported anti-clerical measures, and, together with Lockroy, Sarrien, and Peytral, drew up a political programme of action of which the *Petite République Française* is the organ. From 1893 to 1896 he was again a member of the Chamber of Deputies, where he voted with the Radicals.

GOBLET D'ALVIELLA, dâl-vyê'lâ. EUGÈNE, Count (1846—). A Belgian historian of religion. He was appointed an instructor in the history of religion at the University of Brussels, was elected to the Belgian Chamber of Deputies as a Liberal from Brussels, and in 1892 to the Senate. In 1872 he visited the Sahara, and in 1875 accompanied the Prince of Wales, Albert Edward (now Edward

VII.), on the latter's journey to India. He also became a collaborator on the *Revue de Belgique*. In addition to descriptions of travel, *Sahara et Laponie* (Eng. trans., "Sahara and Lapland," 1874), *Inde et Himalaya*, and several other works, he published notably: *L'évolution religieuse contemporaine chez les Anglais, les Américains et les Hindous* (1884; Eng. trans. by Moden, "The Contemporary Evolution of Religious Thought in England, America, and India," 1885); *La migration des symboles* (1891; Eng. trans., "The Migration of Symbols," 1894), his most important volume, whose thesis is that "the religious symbols common to the different historical races of mankind have not originated independently among them, but have, for the most part, been carried from one to the other in the course of their migrations, conquests, and commerce"; and *Ce que l'Inde doit à la Grèce* (1897). His chief specific achievement is to have made the study of symbols a recognizedly valuable branch of archaeology.

GOBLINS (OF. *gobelin*, from ML. *cobalus*, Gk. *κόβαλος*, *kobalos*, rascal). Familiar demons of popular superstition which lurk about houses. They are also called hobgoblins, perhaps a corruption of hoggoblin. See DEMON.

GOBLINS, THE. A sparkling comedy, interspersed with songs and music, by Sir John Suckling, first acted at Blackfriars in 1638 and revived at the Theatre Royal, January 24, 1667. Tamoren, the chief of the 'goblins,' is a sort of Robin Hood, who terrorizes and metes out poetic justice in the Kingdom of France.

GOBO'NY. A term in heraldry. See COMPONÉ.

GOB'SECK. A novel by Balzac (1830), named after the character about whom its plot is centred, and who appears in others of Balzac's works as the type of the miser and usurer.

GOPY (from Lat. *gobio*, *gobius*, gudgeon, from Gk. *κόβιος*, *kobios*, gudgeon). A spiny-rayed fish of the family Gobiidae, whose ventral fins are completely united into a disk more or less capable of being used as a sucker, enabling the fish to cling to rocks and so resist the power of waves and currents. They have no air-bladder. The true gobies are generally small fishes, some of them inhabiting the shallow bays of the coast, and others deeper water; the species are very numerous, and belong to both hemispheres. One species (of Russia) inhabits fresh water alone. The gobies are very interesting, on account of their habits, and are of the number of nest-building fishes, employing seaweeds and eel-grass for this purpose in spring. When the female has deposited her eggs in the nest, the male watches over them till they are hatched. In Europe, consequently, these fishes are much in request for aquaria, of which they are among the most interesting occupants. A British species (*Gobius minutus*), which ascends rivers, chooses a cockle-shell for its home in some tidal pool. "The shell being placed on the sand with its concave surface downward, the sand beneath it is hollowed out and cemented by a special mucilaginous secretion from the skin; a cylindrical tunnel gives access to the nest, and the whole structure is covered over with loose sand." The female having glued her eggs to the shell, the male guards them for six to nine days, until they hatch. An-

other European goby (*Latrunculus pellucidus*), which is nearly transparent, is remarkable for being perhaps the most short-lived of all vertebrates, being born in midsummer, maturing during the following winter, and spawning and dying upon the approach of summer, so that none live more than a year. Small species of several genera inhabit the coast and estuaries of the Southern United States and of California. See MUDFISH.

GOCH, gög, JOHANNES VON (properly JOHANN PUPPER) (c.1400-75). A German Augustinian monk. He was born at Goch, Prussia, probably studied at Paris, and was the founder of an Order of Canonesses at Tabor, near Mechlin, Flanders, in 1451, of which he subsequently became prior. He may in some respects be considered a precursor of the Reformation, and in his writings, *De Libertate Christiana*, *De Quatuor Erroribus circa Legem Evangelicam*, and *Epistola Apologetica* (1521), he attacks the influence of Pelagianism in the Church, and advocates a return to the text of the Bible as the only true source of religious truth. He was considered a man of profound piety, and as a theologian was unexcelled in his day.

GÖCKINGK, gē'kīnk (also spelled GOEKINGK and GÖKINGK), LEOPOLD FRIEDRICH GÜNTHER VON (1748-1823). A German poet. He was born at Gröningen, and was educated at Halle. After occupying various official positions under the Government at Magdeburg, Wernigerode, and Berlin, and acting for several years as privy councillor to the Prince of Orange-Fulda, he in 1826 removed to Berlin, and subsequently to Wartenberg, Silesia. His *Lieder zweier Liebenden* (3d ed. 1819) won for him great popularity in Germany toward the close of the eighteenth century. His *Gedichte* (rev. ed. 1821) contain the excellent *Episteln* and *Sinnegedichte* (separately published, 2d ed. 1778). The latter are occasionally characterized by a vein of modern political satire.

GOD (AS., OS., Dutch *god*, Goth. *gub*, OHG. *got*, *cot*, Ger. *Gott*, of doubtful etymology, perhaps connected with Skt. *hū*, to call, or with Skt. *hu*, Gk. *χεῖν*, *chein*, to pour; the word is evidently originally a passive participle; the frequent derivation of *god* from *good*, AS. *gōd*, Goth. *gōds*, OHG. *guot*, Ger. *gut*, is entirely erroneous). The eternal and infinite personal Spirit, the Creator and Governor of the universe, unchangeable in His attributes, whose nature is love.

There are two widely differing views of the origin of the idea of God. The first is the older Christian view, that God revealed Himself to the fathers of the people of Israel by such personal communication of Himself as gave them a true, though not complete, view of Him as the only, infinite, and eternal God. The course of the history of this people was such that they gradually came to have a more adequate and stable view of God's nature and attributes, in connection with which their whole conception of truth and religion underwent a process of constant development. Finally, in Jesus Christ the perfect revelation of the Father appeared, and that form was given to all the elements in the idea of God which is now recognized as the highest to which man has attained. Thus the idea of God comes from God Himself, and its history undergoes such a development, and such a one only, as the im-

perfection and development of men has rendered necessary.

The second view is that which regards the idea of God as a purely natural development. As man develops from the animal world, he begins what may be called his human history, without the idea of God. There is, however, a tendency in him toward religion. His wants do not find perfect satisfaction in the world, and he experiences pain and hardship. He must seek help from some source, and the idea of some power or powers which can bestow this upon him arises in his mind by a 'psychological necessity.' Worship may begin in several ways, but probably by his appealing to the spirits of departed ancestors or to the great powers of nature, or both. The idea of gods once introduced, the tendency is toward a multiplication of gods, whence arises polytheism. A tendency soon becomes marked to ascribe to one God the control over some restricted portion of country, or over the affairs of one family. This produces a 'henotheism' within a restricted group of persons, which may be perfectly consistent with polytheism and polytheistic worship apart from the restricted circle to which this one God belongs. But with the growth of the family into a tribe, and of the tribe into a nation, the sphere of the god is also enlarged, and victories over other nations, as well as increasing intelligence about the world and what is in it, will produce ultimately the idea of one God, beside whom all other gods are only pretended gods, having no real existence. Thus monotheism must develop. This view may be said to be at present struggling for recognition as a truly Christian view. It draws its support very largely from the Old Testament Scriptures as interpreted by the representatives of modern higher criticism. The question between the two views may be reduced to the single issue whether there has taken place a supernatural interference in the course of history for the salvation of man, or whether the knowledge of God has arisen by the immanent and impersonal operation of God in nature and in the mind of man.

However the final idea of God may have come to Jesus of Nazareth, it is indisputable that it never emerged in any philosophy independent of Him (India, China, or Greece) and never has been developed since in independence of Him. All the proofs of the existence of God rest upon the idea of order in the world, and this idea is a Christian idea. It is faith, in distinction from a skepticism always possible and often very real. Under the guidance of this Christian element several distinct lines of proof have been presented which coincide in a single complex proof of the divine existence. The first proof is the so-called cosmological, from the mere existence of a dependent world, which does not bear in itself the marks of eternal and independent existence, to an independent something which shall be its cause. This leaves the doctrine in a very vague condition. The next proof adds definiteness to it, the teleological proof. In innumerable individual objects, like the plants, in the adaptations of the chemical elements to each other, the construction of the bodies of animals and of the mind of man, and in the whole universe as revealed more and more by modern study, we see evidences of plan. The Cause of the world is, therefore, capable of making a vast plan, or He possesses intelligence and will, that is, rational personality. The

moral proof argues from the nature of man himself, especially as a moral being, to the nature of God as also moral, or benevolent, which argument is supplemented by the Christian argument which draws the conclusion from the experience of regeneration that God positively seeks to promote the holiness of men. These arguments are completed by the ontological argument, which in its best form ascribes to the highest conception which man is able to form of God (the Christian conception) objective validity, on the basis of the proposition that it is fundamentally inconceivable that the highest conception at which the mind of man can arrive should be a mere subjective creation. These arguments do not so much display the path by which man has come to the knowledge of God, as serve dialectically to unfold its contents.

The modern objection to this line of proof began with Kant, who declared it to be an application of the principle of causality beyond the bounds set by nature as an intellectual principle given man for the knowledge of empirical objects. The sensational school, which Kant was opposing, have also denied the application of causality to reach beyond experience on various grounds. Mill was chiefly influenced by the complexity of the investigation, and particularly by the difficulties created by the existence of pain and sin. Spencer, who has carried this school to its natural results and combined a developed theory of evolution with sensationalism, has based his objections upon the doctrine of the relativity of knowledge, which makes such a conception as that of a first cause essentially unintelligible. In a more popular form the objection is raised against the idea of God that it is incapable of proof, by which is meant such proof as is given to the propositions of natural science, experimental and tangible proof.

It has sometimes been claimed that the idea of God is innate in the soul. If by this is meant that every man has by nature the idea of one infinite person, the claim is manifestly false, for the existence of polytheism at once disproves it. But if it be meant that there are innate in the mind certain principles, such as that of causation, which impel the mind to look up from phenomena to their source, and that the examination of all the phenomena belonging to this sphere will finally give to man the knowledge of God, the proposition in this sense is true. The argument is thus mingled of a *priori* and a *posteriori* elements. The former are necessary as the rational foundation of the argument, the latter to give it contents and to lead it to the concrete result of the being of God. See THEISM.

BIBLIOGRAPHY. Among the numerous excellent treatises of recent times upon theism may be mentioned as the best: Orr, *Christian View of God and the World* (London, 1897); Flint, *Theism* (London, 1886); id., *Anti-Theistic Theories* (Edinburgh, 1884); Martineau, *A Study of Religion* (Oxford, 1888); Harris, *Self-Revelation of God* (New York, 1887); Fiske, *Through Nature to God* (Boston, 1899).

GODARD, gô'dâr', BENJAMIN (1849-95). A French composer, born in Paris. He was a precocious child, and after studying the violin with Richard Hammer, entered the Paris Conservatory, where his teachers were Vieuxtemps (violin) and Reber (composition). In 1865 a violin

sonata was published, and shortly afterwards Godard received a prize from the Institut de France. From this time on, his compositions followed each other rapidly. While not works of genius, they are characterized by felicity of expression, and met with considerable popular favor. His most successful opera was *La Vivandière*, produced at the Opéra Comique shortly after his death. He also wrote: *Pedro de Zalaméa* (1884); *Jocelyn* (1888); *Le Dante* (1890); *Jeanne d'Arc* (1891); and numerous symphonies, suites, concertos, and songs.

GODAVARI, gô-dâ'vá-ré. One of the principal rivers of the peninsula of India, and the largest of the Deccan, rising within 50 miles of the Arabian Sea in the Western Ghats, near Dindori (Map: India, C 5). It flows southeast for 900 miles across the peninsula into the Bay of Bengal. Dividing at Rajamandry, it enters the sea by two principal mouths, the northern at the French town of Yanaon and the southern at Narsapur. About 23 miles above the head of the delta, the Godavari emerges near Rampa from the Eastern Ghats, through which it has passed with so moderate a descent as to be navigable in either direction for 300 miles. Its northern tributaries are the Purna, the Pranhita, the Indravati, and the Saveri; from the south it receives the Manjera and the Maner.

GODDARD, ARABELLA (Mrs. J. W. DAVISON) (1836—): An English pianist. She was born, of English parentage, in Brittany; studied in Paris under Kalkbrenner, and in London under Mrs. Anderson and Thalberg, and made her first public appearance in 1850 at the Grand National Concerts at Her Majesty's Theatre. She continued her studies under Davison, whom she married in 1860. Her most brilliant success was in her interpretation of the last compositions of Beethoven. In 1873-76 she made a successful tour of the world, including America, Australia, and India, and in 1880 retired from professional concert-giving.

GODDESS OF REASON. The new divinity set up by the French Revolutionists in their attempted reconstruction of religion in 1793. On November 10th, in the Cathedral of Notre Dame, changed into a Temple of Reason, the goddess was installed with much ceremony. The part of the goddess was taken by an actress, dressed in white and wearing the Phrygian cap and the tricolor. The cathedral was restored to its proper functions by Napoleon in 1802.

GODEBSKI, gô-dêb'ské, CYPRIEN (1835—). A Polish sculptor, a son of Xavier Godebski. He was born at Méry-sur-Cher, France, and was educated at the Polish school, Batignolles, and in the studio of Joffroy. He spent many years in Galicia and at Saint Petersburg. His principal works include: "Le Réveil," a marble statue (1886); "Enfants," a bronze group for a Polish school (1880); "L'ange de la patrie protégeant deux orphelins" (1884); "Force brutale étouffant le génie" (1889); and busts of Rossini, Vieuxtemps, Zichy, Servais, Prince Gortchakoff, Kraszewski, and others. He also executed a fine monument of the composer Moniuszko for the Warsaw Cathedral; a monument to the heroes of the Crimean War at Sebastopol, and various other monumental works.

GODEBSKI, XAVER (1801-69). A Polish author, born at Frankenthal, a son of Cyprian Godebski, the poet and patriot. He was for many years professor in a Polish school at Paris. His literary work includes the edition of his father's more important writings, works on politics and history, especially a life of Plater (1848), and the studies on social reform in Poland in the eighteenth century (1866), and on the spirit of the times (1860). He also translated several French plays into Polish.

GODEFROY, gô'd'frwâ (Lat. *Gothofredus*). The name borne by a family of distinguished scholars of French origin. The first of these, DENIS GODEFROY (1549-1622), was born at Paris, and after studying at Louvain under Ramus, completed his education at the universities of Cologne and Heidelberg. It was probably at this last place that he adopted Protestant tenets. In 1580 Godefroy quitted France and became a professor of law at Geneva. In 1589 he was made bailiff of the District of Gex, but his house having been pillaged and his library burnt by the troops of the Duke of Savoy, he retired first to Basel and later to Strassburg, where in 1591 he was given the chair of Roman law and history. In 1605 the Elector Palatine of the Rhine called him to be head of the faculty of law at Heidelberg. In 1618 he was sent as envoy to Paris from Frederick V. to Louis XIII. Though numerous offers were made to him, Godefroy preferred to remain at Heidelberg, but in 1621 the presence of the army of the Catholic League under Count Tilly forced him to seek refuge at Strassburg, where he died September 7, 1622. His most important work was his edition of the *Corpus Juris Civilis* (Geneva, 1583), which was long the standard text. He was also the author of numerous works on jurisprudence, and on the classics.—THÉODORE GODEFROY (1580-1649) was the eldest son of Denis Godefroy. In 1602, after being educated at Geneva and Strassburg, he settled in Paris and abjured Protestantism. Although an advocate before the Parliament of Paris, he devoted most of his time to the study of history and eventually became the historiographer royal of France. During the latter half of the Thirty Years' War he was employed as one of the French diplomats at Cologne and Münster, and helped negotiate the Peace of Westphalia in 1648. He died at Münster, October 5, 1649. He was the author of numerous works in French history and politics, and made a large and important collection of documents for the history of France, and of other countries. This was continued by his son DENIS (1615-81), and in 1749 found its way into the library of the Institut de France.—JACQUES GODEFROY (1587-1652), the younger brother of Théodore, passed his life as professor of law at Geneva, and remained true to his Protestant convictions. He is known as the editor of the *Theodosian Code* (Lyons, 1665), upon which he worked for twenty years, and which is still used by jurists. Besides this he published a multitude of works on law and jurisprudence, and he ranks higher as a scholar than even his learned father. Others of the Godefroy family who were distinguished in their time are: JEAN GODEFROY, Sieur d'Aumont (1656-1732), the third son of the younger Denis, and an historian of note; DENIS CHARLES GODEFROY, Marquis of Meulgiroire (1795-1877), the family biog-

rapher, and a scholar of ability. He published *Les savants Godefroy; Mémoires d'une famille pendant les XVIème, XVIIème et XVIIIème siècles* (1873).

GODEFROY, FRÉDÉRIC (1826—). A French literary historian. He was educated for the most part privately, and early devoted his leisure to the study of French language and literature. His *Lexique comparé de la langue de Corneille* (1862) was crowned by the Academy. He also wrote a *Histoire de la littérature française depuis le XVIème siècle jusqu'à nos jours* (2d ed. 1878-81). With governmental support he prepared the voluminous and important *Dictionnaire de l'ancienne langue française et tous ses dialectes du IXème au XVème siècle* (1880 et seq.). This work, laboriously compiled from all authoritative printed and manuscript sources, remains, despite certain defects, a standard reference-book.

GODERICH, göd'rich. See **RIPON**.

GODERICH. Capital of Huron County, Ontario, Can.; a port of entry on Lake Huron, at the entrance of Maitland River, and the terminus of the Buffalo and Goderich branch of the Grand Trunk Railway (Map: Ontario, B 4). It has a good harbor and steam communication with all lake ports, valuable fisheries, salt-refineries, iron-foundries, and machine-works. The United States is represented by a commercial agent. Population, in 1891, 3900; in 1901, 4158.

GODESBERG, gö'des-bërk. A summer resort in the Prussian Rhine Province, situated near the left bank of the Rhine, four miles below Bonn (Map: Germany, B 3). It has an alkaline chalybeate spring, believed to have been known to the Romans, a hydropathic establishment, and numerous fine villas with gardens. A short distance from the village lie the ruins of the Castle of Godesberg, erected by Archbishop Dietrich of Cologne in the thirteenth century. Population, in 1900, 8927.

GODET, gö'dä', FRÉDÉRIC (1812-1900). A Swiss Protestant theologian. He was born at Neuchâtel, and was educated in that city and at Bonn and Berlin. In 1850 he was appointed professor of theology at Neuchâtel, and in the following year received a pastorate which he held until 1866. In 1873 he became the founder of the Evangelical Church of Neuchâtel, which is independent of the State. As a prominent representative of Lutheran orthodoxy, Godet exercised a very wholesome influence on the development of religious thought in Switzerland, which was further stimulated by him in the works entitled: *Histoire de la réformation et du refuge dans le pays de Neuchâtel* (1859); *Commentaire sur l'évangile de Saint-Jean* (3d ed. 1881-88), which has been translated into English (1886), German, Dutch, and Danish; *Commentaire sur l'évangile de Saint-Luc* (3d ed. 1889); *Commentaire sur l'épître aux Romains* (2d ed. 1890; Eng. trans. 1883); *Etudes bibliques* (4th ed. 1889; Eng. trans., first part, *Old Testament Studies*, 3d ed. 1885, second part, *New Testament Studies*, 6th ed. 1885).

GODEY, LOUIS ANTOINE (1804-78). An American publisher. He was born and educated in New York City, and from 1830 to 1877 conducted a magazine at Philadelphia entitled *Godey's Lady's Book*, the first of its class in this country. Among his other publications were

Jarvis's Musical Library and the *Young People's Book*. All his publications were marked by a high moral tone.

GODFATHER AND GODMOTHER. The sponsors of candidates for baptism, and, in the Roman Catholic Church, of candidates for confirmation. See **SPONSORS**.

GODFREY, THOMAS (1704-49). A self-made American mathematician, who acquired some reputation from an improvement which he made in Davis's quadrant. (See **SEXTANT**.) He was a man of intemperate habits, a humble artisan in Philadelphia, but he was sufficiently interested in science to learn Latin that he might read the better class of mathematical literature of the time. The improvement in the quadrant seems to have been due to him, but there was a dispute between him and John Hadley of England as to the priority of the invention. The Royal Society considered the claims of both parties, and rewarded each, sending to Godfrey gifts to the value of a thousand dollars. The account in the *Philosophical Transactions* of the Royal Society of London (abridged edition, London, 1809, vol. vii., p. 667, for 1734) speaks of him as "having under the greatest disadvantages made himself master of the principles of astronomy and optics, as well as other parts of mathematical science," and as having made his invention in 1730, the first account of it appearing two years later.

GODFREY DE BOUILLON, de bö'vö's' (c.1058-1100). One of the leaders of the First Crusade and the first Latin ruler of Jerusalem. He was the son of Eustace of Boulogne and Ida, sister of Gozelo, or Godfrey, the Humpbacked, of Lower Lorraine. The year of his birth is uncertain, but it was about 1058. His family traced its descent from Charles the Great, and later legends made Lohengrin, 'the Knight of the Swan,' Godfrey's progenitor. In the strife over investiture (q.v.) he was on the side of the Emperor, and it was said that he was the first to scale the walls of Rome when it was attacked by Henry IV. in 1084. The legends also recount how he was stricken with disease because of his sacrilege at Rome, and then miraculously healed when he took the Crusader's vow. In 1089 he became Duke of Lower Lorraine. He was one of the leaders in the First Crusade (1096-99), but not commander-in-chief, and after the capture of Jerusalem was elected 'Baron and Defender of the Holy Sepulchre.' According to an untrustworthy legend, he was offered the title of King, but refused "to wear a crown of gold where the Saviour had worn a crown of thorns." He held this dignity for about a year, and died July 17 or 18, 1100. Godfrey is described as a man of large stature and great bodily strength. Many feats of bravery and strength are ascribed to him, such as his combat single-handed with a ferocious bear, or his cleaving asunder the body of a Moslem emir with a single blow of his sword. He made an excellent and energetic ruler of Jerusalem. Many legends clustered about his name, and many deeds were falsely imputed to him. Consult: Sybel, *Geschichte des ersten Kreuzzuges* (Leipzig, 1900); Froboese, *Gottfried von Bouillon* (Berlin, 1879). Hagenmeyer, *Gesta Francorum* (Heidelberg, 1890), gives a full bibliography of all the best works on Godfrey. See **ASSIZE OF JERUSALEM**; **CRUSADES**.

GODHAVN, gôd'häv'n. A town of Greenland, on the south coast of Disco Island. It is the residence of the Danish Inspector of the Northern Inspectorate, and has some fishing industries. Godhavn, also called Lieueuly, is mainly known in America as the stopping-place of many polar expeditions. Population, 213.

GODIN, AMÉLIE. See LINZ, AMÉLIE.

GODIN, gô'dân', JEAN BAPTISTE ANDRÉ (1817-88). A French socialist, born at Esquehéries, in the Department of Aisne. He came from an artisan family, and received the meagre education which was given to boys of his class at that time. When seventeen years old he began a trip through France, in order to perfect his skill as an artisan. Three years afterwards he was a workman in Esquehéries. A small workshop which he established in 1840 prospered, and in 1846 employed about thirty men. Then he moved to Guise, in order to find a better market for his wares. He found time to pick up a very fair education, and became deeply interested in the writings of certain socialists, especially Fourier. He gave material financial assistance to Victor Considérant, who attempted to put Fourier's system into practice near San Antonio, in Texas, and when that plan failed he resolved to try coöperation himself. He gradually introduced reforms into his workshops, such as payment of laborers by the hour instead of by the day. In 1859 he began the construction of the buildings for his co-operative association, or *familiatère*, and before 1886 had fully established profit-sharing. A part of the profits he laid aside as a common fund for education, sinking fund, and other similar purposes, and divided the remainder between labor and capital. Godin had some success in politics. He was elected president of the municipal commission of Guise in 1870, and member of the National Assembly in 1875. He published several books, the chief of which are: *Solutions sociales* (1871); *La politique du travail et la politique des privilèges* (1875); *La souveraineté et les droits du peuple; le gouvernement et le vrai socialisme en action* (1883); *La république du travail et la réforme parlementaire* (1889). His establishment now bears the name of Dequerme et Cie. Consult Bernadot, *Le familiatère de Guise et son fondateur* (Paris, 1889). See FOURIERISM.

GODIN, LOUIS (1704-60). A French astronomer, born in Paris. He studied at the College of Louis le Grand and under Delisle. On May 16, 1735, he started on an expedition to South America to measure a degree of the meridian by geodetic methods. He arrived at Quito, Peru, in February, 1736, established two astronomical stations in the Andes, and was subsequently appointed professor of mathematics at Lima, where, in 1746, he made important seismological studies during the famous earthquake. A year after his return to Europe, in 1752, he was appointed president of the naval academy at Cadiz, where he rendered valuable services during the earthquake of Lisbon. His principal works include: *Histoire de l'Académie des Sciences 1680 à '99* (1728); *El temblor de tierra de Lima, sus causas, efectos y consecuencias* (1748); *Observations astronomiques au Pérou* (1752); *Des tremblements de terre en général, de ceux de Lima et Lisbon en particulier* (1753); *Les possessions espagnoles de l'Amérique du Sud* (1755).

GODIN DES ODONAIS, dâ zô'dô'nâ', JEAN (1712-92). A French naturalist, born at Saint Amand, France. Early in his life he went to Peru, where he was appointed to the chair of natural science and astronomy at Quito (1739). Several years later he began a botanical exploration of Northern Peru and Ecuador, and afterwards removed to Cayenne, where from 1750 to 1765 he explored the neighboring country and Brazilian Guiana. From here he traveled along the Amazon, on the banks of which he made further botanical investigations during a period extending over eight years. On these journeys he prepared illustrations of hundreds of mammals and birds, many of them before unknown, and collected more than 10,000 species of plants. Returning to France in 1773, he gave his collections to the Museum of Natural History at Paris. His numerous publications, comprising works on the botany and languages of South America, include: *Flore raisonnée du Pérou* (1776), containing more than 4000 species, with two volumes of illustrations, in more than 700 plates; *Les plantes de la Guayane* (1777); *Faune du Pérou* (1778), with numerous illustrations; *Flore de la Guayane* (1779), with three volumes of illustrations; *Grammaire comparée des langues indiennes de l'Amérique du Sud* (1784).

GÖDING, gô'ding (Bohemian *Hodonin*). A town of Austria in Moravia, on the right bank of the navigable March, which here forms part of the Hungarian boundary. It is about 70 miles northeast of Vienna, and in an agricultural district (Map: Austria, E 2). The principal attraction is the Imperial castle, with its immense domain. There is a considerable trade in dressed lumber. Population, in 1890, 8482; in 1900, 10,231.

GODIVA, or **GODGIFU** (?c.1080). According to legend, a Saxon lady of Coventry, in Warwickshire, who rode naked through the streets of the town out of devotion for her people. It is impossible to say whether the story is wholly fictitious or partly true. In its developed form the legend runs as follows: About the year 1040, Leofric, Earl of Mercia and Lord of Coventry, imposed certain onerous services and heavy exactions upon the inhabitants of the latter, of which they loudly complained. His wife, the Lady Godiva, having the welfare of the town at heart, besought her husband to give them relief, and was so earnest in her entreaties that at length, to escape from her importunities, the Earl said he would grant her the favor, but only on condition that she would ride naked through the town, supposing, from the modesty of Lady Godiva, that he had imposed an impossible condition. He was surprised with her answer: "But will you give me leave to do so?" As he could not in justice refuse, she ordered that proclamation be made that on a certain day no one should be out of doors, or even look from their houses; and, clothed only in her long hair, she rode through the town. Her husband, in admiration of her intrepid devotion, performed his promise. This circumstance was commemorated by a stained-glass window, mentioned in 1690, in Saint Michael's Church, Coventry; and the legend that an unfortunate tailor, the only man who looked out of a window, was struck blind, has also found commemoration in an ancient effigy of 'Peeping Tom of Coventry,' still to be seen in a niche of one of the buildings. By a charter

of Henry III. (1218), a fair is held at Coventry, beginning on Friday of Trinity week, and lasting eight days. The fair was opened with a grand civic procession, a part of which was, in 1678, the representation of the ride of Lady Godiva. These processions were continued at intervals of from three to seven years until 1826. Some beautiful woman, who represented Lady Godiva, was the principal figure; but many other historical and emblematic personages were introduced. In 1848 the procession was revived with great splendor, and attracted 15,000 strangers. The ceremony has, however, fallen into disrepute, the last procession occurring in 1887. For a full discussion of the legend, consult Freeman, *The Norman Conquest* (Oxford, 1870-79).

GODKIN, EDWIN LAWRENCE (1831-1902). An American editor and publicist, born in Moyness, County Wicklow, Ireland. He graduated at Queen's College, Belfast, in 1851, and during the Crimean War (1854-56) was correspondent of the *London Daily News* in Turkey and Russia. In 1856 he came to the United States, where he read law under David D. Field (q.v.), was admitted to the bar in 1859, and for several years practiced in New York City. From 1862 until 1865 he was a correspondent of the *Daily News* and an editorial writer for the *New York Times*. In 1865 he established and became the editor of the *Nation*, a weekly periodical, which was fashioned after the *London Spectator*, and whose proprietorship was assumed in 1866 by himself, J. M. McKim, and F. L. Olmsted (q.v.). In 1881 the *Nation* was merged with the *Evening Post*, of which it became the weekly edition, and Godkin was thereafter an editor and proprietor of the combined publications. As a journalist he devoted little attention to the organization of newspaper service, and specifically was one of the foremost leader writers in the history of the American press. His editorials in the *Nation* from the first influenced in manifold ways the best thought of the time, and from 1884, previous to which the paper had been avowedly Republican, he made the *Evening Post*, of which he became editor-in-chief in 1883, the leading independent American daily. His style was noteworthy for its directness, its pith, and a certain effective humor. His critical estimates were singularly acute and mainly just. He was a prominent figure in reforms affecting the causes of sound money, of Reconstruction, and of the civil service. In him the idea of public office as a public trust had undoubtedly its chief exponent in the United States. He consistently and severely opposed the 'spoils' or close party system in American politics, as well as 'boss' or 'machine' rule in various forms. His fearlessness often exposed him to disapproval, and not seldom to abuse. In preparation for the New York City municipal campaign of 1890, he printed in the *Post*, with scathing editorial comment, a series of biographies of Tammany Hall leaders, which resulted in the issuance against him of several warrants of arrest on charges of criminal libel. The cases were dismissed for lack of prosecution. He received the degree of D.C.L. from Oxford University in 1897. He published a *History of Hungary, A.D. 300-1850* (1856); an excellent work on *Government* (1871), in the "American Science Series"; and *Reflections and Comments, Problems of Modern Democracy, and Unforeseen Tendencies of*

Democracy—all valuable collections of papers respectively from the *Nation*, the *Atlantic*, and other sources.

GODMAN, JOHN D. (1794-1830). An American physician, born in Annapolis, Md. He graduated at the University of Maryland in 1818, was professor of anatomy in the Medical College of Ohio, was one of the editors of the *Philadelphia Journal of Medical Science*, and in 1826-27 was professor of anatomy and physiology in Rutgers Medical College in New York. He was the author of many articles in the *Encyclopædia Americana*, and in addition published: *American Natural History; Anatomical Investigation* (1824); and *Rambles of a Naturalist*.

GODODIN. A seventh-century epic by the Welsh bard Aneurin, who was the son of the chief of the Gododin tribe, founded on the week's battle of Catterath (603). It is about 900 lines in length, and in 1852 was translated by Rev. John Williams, at Ithel. John Morley has also translated parts of it, and the poet Gray founded his "Death of Hoel" upon it. Consult Elton, *Origins of English History* (London, 1882).

GÖDÖLLÖ, gē'dē-lē. A market-town in Hungary, about 16 miles northeast of Budapest (Map: Hungary, F 3). It is chiefly noteworthy for its royal château, with an extensive park, formerly the property of the Princes Grassalkovich, but purchased in 1867 by the Hungarian nation and presented to the King on the occasion of his coronation. In the vicinity is Besnyő, a noteworthy pilgrims' resort. Population, in 1890, 4844. At Gödöllő, April 6-7, 1849, the Hungarians under Görgey defeated the Austrians under Windischgrätz. The victory led to the proclamation of Hungarian independence, April 14, 1849.

GODOLPHIN, SIDNEY, first Earl of (1645-1712). An English statesman. The third son of Sir Francis Godolphin, he was born at Helston, Cornwall, and was educated at Oxford, where he received the degree of M.A. in 1663. The previous year he was page of honor to Charles II., and in 1678 he became master of the robes. From 1668 to 1679 he was a member of Parliament for Helston, then two years for Saint Mawes. In 1679 he was one of the commissioners sent to Holland to negotiate the Peace of Nimeguen. Next year the Government appointed him a Lord of the Treasury, and in 1684 Secretary of State, with the title of Baron Godolphin of Rialton. Although his dislike of Roman Catholicism led him to vote for the exclusion of the Duke of York from the succession, on the Duke's accession as James II. Godolphin became chamberlain to the Queen, and afterwards the King gave him a place on the commission sent to treat with William of Orange. In 1690 William appointed him First Lord of the Treasury, and five years afterwards one of the seven lords justices for the administration of government during the King's absence. As Godolphin was guilty of secret correspondence with James II. at Saint Germain, he resigned his office in trepidation upon Sir John Fenwick's confession. When Fenwick was beheaded and his story discredited, however, Godolphin again became a Lord of the Treasury (1700). Appointed Lord Treasurer on the accession of Anne (1702), he remained head of the home Government during eight years, mainly through the influence of the Duke of Marlborough, whom Godolphin staunchly support-

ed with funds for the prosecution of the Duke's wars. In 1706 Godolphin was created Earl of Godolphin and Viscount Rialton. His position as head of the Whig Government came to an end in 1710, when he fell from power and was supplanted by Harley. He died two years afterwards at Saint Alban's. A man of remarkable intelligence and of businesslike habits, he was thorough in everything he did, and in an age of corruption he kept his hands pure. Consult: Elliot, *Life of Sidney, Earl of Godolphin* (London, 1888), very favorable; Collins, *Peerage* (9 vols., London, 1812); Evelyn, *Diary* (4 vols., London, 1879); Clarke, *Life of James II.* (2 vols., London, 1816); Macpherson, *Original Papers* (2 vols., London, 1775); Burnet, *History of His Own Time* (Oxford, 1833); and the various histories of England.

GODOLPHIN BARB, THE. The sire of the Matchem branch of thoroughbreds, foaled about 1729, and imported from Paris in the reign of George II. He died in 1753. In 1825 Eugène Sue founded a story upon his history. The sires of the other two branches of the thoroughbred are The Darley Arabian and The Byerly Turk.

GODON, SYLVANUS WILLIAM (1809-79). An American naval officer. He was born in Philadelphia; entered the navy as a midshipman in 1819; served in the Mexican War; and, in command of the *Mohican*, took part in the attack on Port Royal in 1861. In 1863 he became commodore, and in the attacks on Fort Fisher (q.v.) he commanded a division of Admiral Porter's fleet. He was made rear-admiral at the close of the war; commanded the South Atlantic Squadron in 1866-67; was commandant of the Brooklyn Navy Yard in 1867-70; and was retired in 1871.

GODOWN' (Malay *gadong*, *godong*, warehouse). A term applied in the East Indies to a storehouse or building located on a wharf and chiefly used for the storage of goods.

GODOWSKI, gô-dôv'skê, LEOPOLD (1870-). A Polish-American pianist. He was born at Vilna, in Russian Poland, and received his first instruction from local teachers. From 1881 to 1884 he was student at the High School of Music, Berlin, coming from there to America on an extended concert tour (1884-85). From 1886 to 1890 he studied with Saint-Saëns in Paris. During the next two years he made his second tour of America. In 1902 he became director of the pianoforte department of the Chicago Conservatory, and continued to sustain his reputation as one of the most successful concert pianists in America. He has published several instrumental compositions and a few songs.

GODOY, gô-dô'ê, MANUEL DE, Duke of Alcudia (1767-1851). A Spanish statesman. He was born at Badajoz, and at the age of twenty entered the King's bodyguard at Madrid, where his personal attractions gained him the favor of Charles IV., and of his Queen, Maria Luisa. He became lieutenant-general and Duke of Alcudia in 1792, and in the following year was made Prime Minister. He immediately plunged into war with France, which resulted disastrously for Spain, and was concluded by the Treaty of Basel in 1795, which procured for Godoy the title of Prince of Peace. He was also made a grandee of the first class, and received a gift of large estates. Though forced to resign the office of Minister in 1798,

he nevertheless remained the principal power in Spanish politics. Concluding an alliance with France against Portugal, Godoy invaded that country in 1801, and by the Peace of Badajoz forced Portugal to cede part of its territory to Spain. In 1804 he was made generalissimo of the Spanish forces on land and sea. The ill success of the war against England, culminating in the defeat of Trafalgar, stirred up great popular hatred for Godoy, and he had to contend also with the hostility of the nobles, who were envious of his sudden elevation. The Crown Prince Ferdinand placed himself at the head of a Court faction, and Godoy's attempt to stir up the King against the Prince only served to excite popular feeling. When Godoy, upon the invasion of Spain by the French troops in 1808, prepared to escape with the King and the Queen to Mexico, an insurrection broke out at Aranjuez. The King was forced to imprison the hated Minister to save his life from the mob. Napoleon, who wished to make use of Godoy in his raid on the Spanish crown, summoned him to Bayonne, where he signed Charles's act of abdication in favor of his son Ferdinand. (See CHARLES IV.; FERDINAND VII.) The latter part of his life was spent at Rome, and, after 1830, in Paris. Reduced to straitened circumstances for a long time, he received back part of his confiscated property in 1847, together with his titles. He died in Paris, October 7, 1851. His memoirs were published in French by Esménard (Paris, 1836). Consult Ovila y Otera, *Vida política y militar de D. M. Godoy* (Madrid, 1844).

GOD SAVE THE KING (or **QUEEN**). The national anthem of Great Britain, of which the music by adoption is that of several of the German States. It is played and sung in every part of the British Empire alike on solemn and festive occasions. Its origin has long been a subject of controversy. The contentions that it is of French or Scotch origin have been disproved, but no definite conclusion has been reached respecting the claims of Henry Carey (1696?-1743) to its authorship. He is credited with having composed both words and music about 1740, though he never claimed the song as his, and though none of his friends put forward such a claim until his son, some fifty years later, petitioned the Government for a pension on the ground that his father had written the hymn. The evidence which he adduced in support of this was purely circumstantial, and the petition was refused. On the contrary, there are traces of the existence of the song, or a similar one, long before Carey's time. A Latin hymn, "O Deus Optime," which still exists, and whose words are a counterpart of the present hymn, was sung in 1740. As for the music, John Bull (c.1563-1628) wrote an 'ayre,' still existing, which is identical in rhythm and similar in melody to "God Save the King." The hypothesis, backed by considerable circumstantial evidence, is that the above Latin words, or their prototypes, were written in 1688, and set to Bull's 'ayre' by their author. There is record of such a hymn having been sung in King James's Chapel. The song would naturally be preserved by the Stuarts, and the music, passing through various popular transformations, would ultimately reach its present form. It will be seen that this theory does not preclude Carey from having translated the words and given the final shape to the music.

The words and music were first published anonymously in the *Harmonia Anglicana* (1742), and appeared in the *Gentleman's Magazine* (1745). It has been chosen for a national air in Germany, where it is sung to the words *Heil dir im Siegerkranz*, and it was sung in Russia until the new anthem was written in 1833. In the United States it has long been known as the air to which "My Country, 'Tis of Thee" is sung. Consult: Bateman, "The National Anthem," in the *Gentleman's Magazine*, vol. cclxxv. (London, 1893), and Hadden, "The 'God Save the Queen' Myths," in *Argosy*, vol. lxxii. (London, 1900); Cummings, *God Save the King* (London, 1902); also Chappell, *Collection of National Airs* (London, 1838-40). See NATIONAL HYMNS.

GOD'S FOOL. A novel by Maarten Maartens (1892), considered by the author his masterpiece. The fool, Elias Lossel, by accident in childhood became blind, deaf, and obscured in mind. In spite of all, he had a sweet and loving nature. Handsome and wealthy, he was at last the victim of his half-brother's greed. The story gives a realistic picture of life in a small Dutch city.

GOD'S TRUCE. See TRUCE OF GOD.

GODTHAAB, góthab (Dan., good hope). A town and harbor of Greenland, on the west coast, the capital of the Danish Southern Inspectorate and the residence of the Danish Inspector. It was founded by Hans Egede in 1721, and is the oldest colony in Greenland. Population, 946.

GODUNOFF, gódy-nóf, BORIS (c.1551-1605). A czar of Russia. He became to all intent regent during the reign of Feodor I. (1584-98). In 1591 he is said to have caused the murder of the Czarevitch Demetrius, and in 1598, upon Feodor's death, was elected to the throne. He had previously (1591) defeated the Khan of the Crimean Tatars, and in 1589 effected the separation of the Russian Church from the Patriarchate of Constantinople. As Czar he appears to have been in the main clement and progressive; but the favor shown by him to foreigners and numerous innovations introduced by him resulted in considerable popular discontent. Thus Southern Russia was prepared to revolt to the standard of the first false Demetrius in 1604. Godunoff's history has been utilized by Pushkin in a drama of the name, for a German rendering of which consult von Bodenstedt's translation of the complete works of that author (vol. iii., Berlin, 1855).

GODWIN, or **GODWINE** (?-1053). An earl of the West-Saxons. Nothing is known definitely of him until 1018, when he is described as *dux* or earl. About 1020 he was Canute's most powerful official. More than any other person he contributed to the elevation of Edward the Confessor to the English throne, and from that time Godwin was the head of the national party, as opposed to the Norman Court favorites. He was Earl of Wessex, and enormously wealthy; his son Swegen was Earl of Hereford, Gloucester, and Oxford; his son Harold was Earl of East Anglia; his wife's nephew, Beorn, was Earl of Hertfordshire and Buckinghamshire; and his daughter Edith was Edward's Queen. As the Norman party became powerful, Godwin's influence over the King declined. The crimes of his son Swegen, who was outlawed for the seduction of an abbess and the murder of his cousin Beorn, weakened his position. Finally in 1051, when

Godwin refused to obey the orders of Edward, to punish the citizens of Dover on account of complaints of ill treatment made by the Normans, he lost the King's favor, was outlawed, and fled to Flanders. Godwin attempted to treat with the King, but finding this of no avail, resorted to violence, encouraged in this by the promises of support extended him everywhere in England. In September, 1052, he sailed up the Thames with a strong fleet and was enthusiastically received by the people. The King yielded, and on September 15th restored to him and his family all his property which had been confiscated. Soon after Godwin became ill, and died, April 14, 1053. Consult: Freeman, *The Norman Conquest*, vols. i. and ii. (Oxford, 1870-79), for a favorable view of Godwin; and Green, *The Conquest of England* (London and New York, 1883), for a rather unfavorable estimate.

GODWIN, FRANCIS (1562-1633). An English bishop and author, born at Hannington, Northamptonshire. He studied at Christ Church, Oxford, where he graduated in 1580, took orders, and became rector of Sampford, and afterwards Vicar of Weston-in-Zoyland and subdean of Exeter (1596). His *Catalogue of the Bishops of England* (1601) attracted the attention of Queen Elizabeth, who made him Bishop of Llandaff. In 1617 he was transferred to the see of Hereford by James I. He revised his *Catalogue* several times (1615 and 1616), and also wrote *Rerum Anglicarum Annales* (1616). The best known of his works is *The Man in the Moone, or a Discourse of a Voyage Thither by Domingo Gonsales, the Speedy Messenger* (1638), written while he was in college. It is supposed to have influenced Cyrano de Bergerac's *Voyage to the Moon*, as it was translated into French by J. Baudoin (1648), and traces of it seem to appear in parts of *Gulliver's Travels*.

GODWIN, MARY WOLLSTONECRAFT (1759-97). An English miscellaneous writer. She was born at Hoxton, near London, April 27, 1759, and was of Irish descent. Her mother died in 1780, and owing to the brutality of her father, Mary and her sisters were compelled to leave his house. Mary earned her living as school-teacher and governess until 1788, when she settled in London and was employed by Johnson the publisher as reader and translator. While at Paris in 1792 she met Gilbert Imlay, an American merchant and author. After bearing to him a daughter she was deserted. On March 29, 1797, she married William Godwin, and became the mother of Mary, the future Mrs. Shelley. She died September 10, 1797. The outline of her career contributed to the plot of Mrs. Amelia Opie's *Adeline Mowbray* (1804). Mrs. Godwin was one of the 'advanced women' of her time. Her most notable work is *Vindication of the Rights of Women* (1792). She attacked Rousseau's ideal woman, the heroine of novels and boarding-schools. She advocated the establishment of Government day schools, and maintained the right of women to enter the professions and politics. In short, her thesis was the equality of the sexes. Among her other works are: *Thoughts on the Education of Daughters* (1787); *Original Stories from Real Life* (1788); *Vindication of the Rights of Men*, a letter to Burke (1790); *Posthumous Works*, containing "Wrongs of Women," fragment of a novel, and "Letters and Miscellaneous Pieces" (4 vols., 1798). Consult: Godwin, *Memoirs of the Author*

of a *Vindication of the Rights of Women* (London, 1798); Paul, *Mary Wollstonecraft: Letters to Imlay*, with memoir (London, 1879); and Pennell, *Life of Mary Wollstonecraft* (Boston, 1884).

GODWIN, PARKE (1816-1904). An American journalist and author. He was born in Paterson, N. J., February 25, 1816, and after graduating at Princeton in 1834, practiced law for a short time in Kentucky, but after 1837 was for many years in the main connected with the New York *Evening Post*, of which the poet Bryant, his father-in-law, was for so long chief editor. Godwin conducted in 1842 a weekly, the *Pathfinder*, contributed much to the *Democratic Review*, was one of the editors of *Putnam's Magazine*, deputy collector in the New York Custom House under President Polk, and an early member of the Republican Party, though a consistent advocate of free trade. Two volumes of essays from *Putnam's Magazine* are gathered in *Out of the Past* (1870). Among his numerous other publications may be mentioned: *A Popular View of the Doctrine of Fourier* (1844); *Democracy, Civic and Constructive* (1844); *Vala: A Mythological Tale* (1851); *Political Essays* (1856). Godwin compiled a *Handbook of Universal Biography* (1851), and *Cyclopædia of Biography* (1863). He edited the *Works of W. C. Bryant*, with a *Life* (1884), and made translations from the prose of Goethe, Fouqué, and Zachokke. He also wrote an ingenious but rather erratic *New Study of Shakespeare's Sonnets* (1901).

GODWIN, THOMAS (1587-1642). A Church of England scholar. He was born at Wookey, Somersetshire, educated at Oxford; was rector of Brightwell, Berkshire, and died there March 20, 1642. He is remembered for his English treatise on Roman antiquities, with the Latin title *Romanæ Historiæ Anthologia* (1614); and *Moses and Aaron, or Civil and Ecclesiastical Rites Used by the Ancient Hebrews* (1625).

GODWIN, WILLIAM (1756-1836). An English novelist and political writer. The son of a dissenting minister, he was born at Wisbeach, Cambridgeshire, March 3, 1756. After studying at the Hoxton Presbyterian College, he became minister at Ware in Hertfordshire, and in 1780 minister at Stowmarket in Suffolk. Having been shaken in his religious belief, he gave up preaching in 1783, and by 1787 he was 'a complete unbeliever.' He was already devoting himself to literature. After a *Life of Chatham* (1783), *Sketches of History, in Six Sermons* (1784), and considerable hack-work, he published the famous *Enquiry Concerning Political Justice* (1793), in which were presented the most radical theories of French philosophy on morals and government. By this book he is best known. It was followed by *The Adventures of Caleb Williams* (1794), a remarkable novel, intended to illustrate the political views advanced in the *Political Justice* and by *The Enquirer* (1797), a collection of essays on morals and politics. In 1796 he formed an alliance with Mary Wollstonecraft (q.v.). After some months they yielded so far to custom as to be married. His wife died a short time after, in giving birth to a daughter, the future wife of the poet Shelley. In 1799 he published a successful romance entitled *Saint Leon*. In 1801 he married a Mrs. Clairmont. To secure a more certain support, Godwin and his wife started in 1805 a small publishing business, but he also worked indefatigably with his pen to the end of

his life. He wrote many school books; *Life of Chaucer* (1803); *Fleetwood*, a novel (1805); *Mandeville*, a novel (1817); *Of Population* (1820), a reply to Malthus; *History of the Commonwealth of England* (1824-28); *Cloudesley*, a novel (1830); *Thoughts on Man* (1831); *Deloraine*, a novel (1833); and *Lives of the Necromancers* (1834). As he grew old, he modified his opinions on politics and society, and especially on marriage, which he warmly commends in some of his later works. Many of his books were translated into foreign languages. He died in London, April 7, 1836. Consult: Paul, *William Godwin: His Friends and Contemporaries* (London, 1876); Hazlitt, essay in the *Spirit of the Age* (London, 1825); and Stephen, *English Thought in the Eighteenth Century* (London, 1876).

GODWIN-AUSTEN, göd'win-ās'ten. One of the highest mountain peaks in the world, situated in the Mustagh range of Northern Kashmir (Map: India C 1). It was named after Lieutenant-Colonel Godwin-Austen of the Trigonometrical Survey of India. Its altitude is placed at 28,265 feet.

GODWIN-AUSTEN, HENRY HAVERSHAM (1834-). An English topographer and geologist. He was born at Teignmouth, the son of Robert A. C. Godwin-Austen (q.v.). He was educated at the Royal Military College, Sandhurst, obtained a commission in the Twenty-fourth Regiment of Foot in 1851, and joined it in India in the following year. He served with distinction in the Second Burmese War, and after its close became an assistant topographer in the East Indian Trigonometrical Survey. In 1857 he was connected with the Government Survey in Kashmir, where he made the discovery of the important Baltoro glacier at the head of the Shigar River. In 1862-63 he conducted surveys in Ladakh, making thirteen ascents of mountain peaks, among them that of Mata, 20,607 feet high. He served in the Bhutan campaign in 1874, and took part in the expedition against the Daffas in the Eastern Himalayas. He retired from the army in 1877 with the rank of lieutenant-colonel. He was elected a fellow of the Royal Society. His writings include numerous important articles and monographs for various scientific magazines and society reports. His most important work is *On the Land and Fresh Water Mollusca of India* (1882-99), a monumental work in nine parts.

GODWIN-AUSTEN, ROBERT ALFRED CLOYNE (1808-84). An English geologist, born near Guildford, the son of Sir H. E. Austen. He was educated at Midhurst School, at a military college in France, and at Oxford, where, after graduation, he was elected a fellow of Oriel College. Here he studied geology under William Buckland. In 1833 he married a daughter of Gen. H. T. Godwin, upon whose death in 1854 he prefixed, by royal license, the name of Godwin to his own. His geological studies and discoveries, covering a period of more than half a century, were extensive and valuable, and his contributions to geological literature were considered authoritative, particularly the result of his investigations in Devonshire. He edited, as literary executor, the *Memoir on the Fluvio-marine Tertiaries of the Isle of Wight* (1856), left by Edward Forbes in manuscript; and completed the *Natural History of the European Seas*

(1859), begun by the same author. In addition to these, he wrote numerous original articles and notes in various geological journals. He was made a fellow of the Geological Society of London in 1830, a fellow of the Royal Society in 1849, and was twice president of the Geological Section of the British Association.

GODWIN'S OATH. A proverbial expression for a false oath, originating in the story that Godwin, Earl of Kent, was choked to death by a piece of bread while calling Heaven to witness his innocence of the murder of Alfred, the brother of Edward the Confessor.

GODWIT (of doubtful etymology; possibly from A.S. *gōd*, good + *wit*, wit; hardly from *gōd*, good + *wiht*, wight, creature, or from *god*, God + *wit*, wit, or *wiht*, wight, creature). A genus (*Limosa*) of large curlew-like shore-birds of the snipe family (*Scolopacidae*), with very long bill, slightly curved upward, and long slender legs. All the species frequent marshes and shallow waters, often those of the seacoast, where they seek their food by wading and plunging the long bill into the water or mud like snipes. They sometimes also run after small crustaceans or other animals, and catch them on the sands from which the tide has retired. All are noted for their loud, yelping cries. Two species belong



BILL OF MARBLED GODWIT.

to North America—the great marbled godwit (*Limosa fedoa*), and the Hudsonian godwit (*Limosa hæmastica*). Neither is very numerous, and both are visible only when passing back and forth from their northern breeding haunts to their tropical winter homes; the marbled godwit, however, nests in Iowa and northward. The general hue of these birds is rufous or cinnamon, the marbled godwit being paler than the Hudsonian, but both vary greatly with age, sex, and season; the former has the reddish tail barred with black and without any white, while the latter has a black tail broadly white at the base. The females are uniformly larger than the males. Godwits build their nests anywhere on the ground, not necessarily near water, and lay three and four eggs, olive drab spotted with umber brown. Four or five other species of godwit are found in the Old World. The flesh of all is good, and in Elizabethan England it was regarded as an expensive delicacy, often celebrated in the prose and verse of the period. The incessant pursuit of this bird, particularly by netting on the fens, nearly exterminated it in Great Britain. It is taken by gunners whenever encountered, but is not much sought after nor especially valued either for sport or food. See Colored Plate of SHORE-BIRDS.

GOEBEL, gē'bel, WILLIAM (1856-1900). An American politician. He was born in Sullivan County, Pa., and removed to Covington, Ky., in early boyhood. He began the study of law in 1873, and was admitted to the bar. He won a reputation as a trial lawyer, and as a political speaker and leader in the Democratic Party, and in 1887 was elected to the Kentucky State Senate, to which body he continued to be reelected at every election up to and including 1898. He was

active in building up a political machine, was unscrupulous in his methods, and aroused much bitter personal antagonism, particularly among the old-time leaders of the party. One of his personal quarrels culminated in his shooting and killing Col. John D. Sandford, for which he was acquitted on the grounds of self-defense. In 1897 he secured the passage of a bill of which he was the author, relieving the courts of all power in the appointment of election officials, and creating a State election commission of three members, to be chosen by the Legislature, not necessarily bi-partisan, which should have the power to appoint local boards on the same principle. By this act, known as the 'Goebel law,' it was hoped to wrest the control of the State from the Republicans, and to assure Democratic ascendancy for all time to come. The bill was passed over the veto of Governor Bradley (Republican), and was held constitutional by the State Supreme Court in December, 1898. In 1899 Goebel set out to secure the Democratic nomination for Governor, and after an exciting and bitter canvass was nominated in June. Seceding Democrats, however, placed in nomination John Young Brown, and the election resulted in the choice of W. S. Taylor, the Republican candidate, by about 2300 votes. After the convening of the Legislature, January 1, 1900, Goebel began a contest. The matter was referred to a legislative committee which it was understood was about to report in Goebel's favor, when, on January 30th, he was shot, while standing in front of the State Capitol, by an assassin concealed in a neighboring building, doubtless as the result of the political quarrel in which he was involved. The Democratic members of the Legislature immediately declared him Governor, and the oath of office was administered to him on January 31st. He died on February 3d.

GOEBEN, gē'ben, AUGUST VON (1816-80). A German soldier. He was born at Stade, in Hanover, entered the Prussian military service at the age of seventeen, but in 1836 went to Spain as a partisan of Don Carlos, and took an active part in the fighting between 1836 and 1840, being repeatedly wounded and twice taken prisoner. After the end of the Carlist War he returned to Germany, and wrote an account of his Spanish experiences, entitled *Vier Jahre in Spanien* (1841). Reëntering the Prussian Army, where he served on the staff, he took part in the campaign against the revolutionists in Baden in 1849, and became, in 1855, chief of staff of the Fourth Army Corps. In 1860 he was Prussian attaché with the army of the Spanish General O'Donnell, in the campaign in Morocco. In 1864 he took a prominent part in the war against Denmark, and became, in the following year, lieutenant-general and commander of the Thirteenth Division. At the head of this division he first entered Hanover in the war of 1866, and then fought successfully at Kissingen and other places in Bavaria. In the Franco-German War, as commander of the Eighth Army Corps, he distinguished himself at Saarbrücken and Gravelotte, and took part in the siege of Metz. In January, 1871, Goeben was appointed commander of the First Army Corps, and fought a decisive battle at Saint Quentin (January 19th), when he defeated General Faidherbe, and caused the disbanding of the French Army of the North. Besides the excellent account of his experiences in Spain, Goe-

ben wrote valuable articles in military journals on the wars of 1866 and 1870-71.

GOEDEKE, gē'de-ke, KARL (1814-87). A German historian of literature. He was born at Celle, and was educated at Göttingen, where he was professor from 1873 until his death. He was a remarkably prolific author, and after writing several novels and the drama *König Kodrus, eine Missgeburt der Zeit*, under the pseudonym of Karl Stahl, devoted himself to critical and biographical literature. The long list of his publications includes: *Deutschlands Dichter von 1813 bis 1843* (1844); *Elf Bücher deutscher Dichtung von Sebastian Brant bis auf die Gegenwart* (1849); *Deutsche Dichtung im Mittelalter* (2d ed. 1871); and *Grundriss zur Geschichte der deutschen Dichtung* (2d ed. 1884 et seq.), his principal work. His biography of Goethe is well known.

GOEKINGK, gē'kēŋk, LEOPOLD FRIEDRICH GÜNTHER VON. See GÖCKINGK.

GOERCKE, gēr'ke, JOHANN (1750-1822). A German physician, born at Sorquitten, East Prussia. He entered the Prussian Army as a surgeon at the age of seventeen, and in 1789 was appointed one of the three chief surgeons in the army. Meanwhile he had traveled extensively in Austria, Italy, France, and in England, where he entered into friendly relations with John and William Hunter, Bell, Cooper, Hamilton, and other equally celebrated surgeons. In 1797 he was appointed chief surgeon of the Prussian Army, in which capacity he rendered invaluable services during the various campaigns terminating with the battle of Waterloo. He founded several educational institutions for military surgeons, the most important of which was the celebrated *Pepinière*, afterwards known as the *Medicinisch-Chirurgisches Friedrich-Wilhelms-Institut*. His literary works include: *Pharmacopœia Castrensis Borussia* (1805); and *Beschreibung der Krankentransportmittel bei der königlich-preussischen Armee* (1814).

GOËS, gō'ash, BENITO DE, or BENTO DE (1562-1607). A Portuguese traveler and Jesuit priest. He was born on the island of San Miguel, one of the Azores, and until his twenty-sixth year led the life of an adventurer in the East Indies. In 1588 he entered the Order of Jesus, and in 1603 was sent on a mission to the Great Mogul, and thence to Cathay. At the Court of the Emperor Akbar he acquired an extensive knowledge of the geography of Asia, ascertaining after his arrival at Su-chau (1605), on the Chinese frontier, that Cathay and China were identical. His interesting notes and observations were published after his death by the Italian Jesuit missionary Matteo Ricci. Many translations into German, French, and English were also made, one of them entitled: *The Report of a Mahometan Merchant which had been in Cambalu, and the Travels of Bento de Goës . . . from Lahor to China by Land* (1625).

GOES, DAMIÃO DE (1501-73). A Portuguese historian and diplomat, born at Alemquer (Estremadura). King John III. of Portugal sent him on several important diplomatic missions to Flanders (1523), Poland (1529), Denmark and Sweden (1531). He then spent several years in Italy. In the defense of Louvain in Flanders against the French (1542) he was taken

prisoner. Upon his return to Portugal he was given charge of the archives, but his ideas were too advanced for the age. He was dispossessed of his office by the Inquisition in 1571, and was imprisoned, and died in obscurity. Among his works are: *Legatio Magni Imperatoris Indorum Presbyteri Joannis* (1518); *Legatio David Æthiopie Regis, ad Clementem Papam VII.* (1533); *Damiani a Goes Commentarius Rerum Gestarum in India* (1539); *Hispania* (1542); *De Bello Cambratico Ultimo* (1547); *Chronica do felicissimo rey D. Manuel* (1556-57); and *Chronica do principe D. Joan* (1567).

GOES, gōōs, HUGO VAN DER (?-1482). A Flemish painter. He was born in Ghent, but is spoken of as a painter of Bruges. He studied with Jan van Eyck. In 1468 he was employed on the decorations for the marriage festivities of Margaret of York and Charles the Bold, because of his special talent for designing escutcheons, flags, and wall-hangings. The records of the Guild of Ghent show his appointment as elder in 1472, and in 1476 he entered a brotherhood near Brussels, in the monastery of Rooden Cloestere. Frequent revels brought his life to a sad end in 1482. He was "the earliest master of the school who painted blue draperies broken with green." His execution is careful in drawing and his painting is solid. There is but one authentic painting by him, the "Nativity," in the Church of Santa Maria Nuova, Florence.

GOES, JAN ANTONISZ (Latin form, JOANNES ANTONIDES) VAN DER (1647-84). A Dutch poet, born at Rotterdam. Owing to the success of his first efforts at poetic composition, he found a patron in a wealthy gentleman of Flushing, who paid for his education at Utrecht, where he studied medicine. Afterwards he became a member of the Admiralty at Rotterdam. Goes was a poet of considerable power, and may in many respects be regarded as the last of the Dutch classics. He was very precocious, and before the age of twenty-five eulogies had already been written in his honor by Kaspar Brandt, Vollenhove, Huygens, Oudaeu, Vondel, and other distinguished authors. One of his best productions is *De Ystroom* (1671). The poem entitled "Bellone aen Bant," celebrating the peace between France and Holland, also occupies a very high rank in Dutch literature.

GOES, gō'ash, PERO DE (1503-54). A Portuguese pioneer, born in Lisbon. He conducted Martin Alfonso de Sousa's expedition to Brazil in 1530. Two years afterwards he received a strip of territory on the coast, and here he first successfully introduced the cultivation of sugarcane. His plantation was subsequently destroyed by the Indians, and Goes went abroad to secure the assistance of the King in suppressing the native uprisings. He was thereupon appointed to assist the newly appointed Governor-General, Sousa, and contributed greatly to the pacification of the country and the establishment of organized government. He is said to have been the first to bring specimens of the tobacco-plant to Europe (1547).

GOES, gōōs, or TERGOES, tēr'gōōs. A seaport of Holland, situated on the island of South Beveland, about 3¼ miles from its northern coast and 23 miles west of Bergen-op-Zoom (Map: Netherlands, B 3). The town has a fine Gothic church, dating from 1442, and the re-

mains of an ancient castle of Jacqueline of Bavaria. It has a harbor formed by a canal communicating with the East Scheldt, ship-building docks, and an active trade in hops, salt, and grain. Population, in 1889, 6600; in 1899, 7000.

GOESSMANN, gēs'mán, CHARLES ANTHONY (1827—). An American chemist. He was born at Naumburg, in Hesse, and was educated at Göttingen, where he became assistant in the chemical laboratory and (1855) privat-docent. In 1857 he came to America; was chemist and superintendent of a Philadelphia sugar-refinery until 1861, and then accepted a position with a Syracuse salt company. While in this position (1861-69) he spent one year (1862-63) as professor of chemistry in the Rensselaer Polytechnic Institute. In 1869 he became professor of chemistry in the Massachusetts Agricultural College at Amherst, and also chemist to the State Board of Agriculture. Goessmann traveled in Cuba and in Louisiana, Michigan, and Canada. His writings include: *Chemical Composition of the Brines of Onondaga* (1862); *Brines of Michigan* (1862-63); *Best Mode of Manufacturing Coarse or Solar Salt from the Brines of Onondaga* (1863); *Mineral Springs of Onondaga* (1866); *Salt Deposits of Petite-Anse, La.* (1867); *Salt Resources of Goderich, Canada* (1868); *Application of Caustic Magnesia for Sugar Refining* (1864); *Manufacture of Sugar in Cuba* (1865); besides chemical articles in Liebig's *Annalen der Chemie* (vols. lxxvii., lxxxix., xc., xcii., xciv., xcvii., xcvi., xcix., c., ci., civ.) and in *Silliman's American Journal of Science* (vols. xlv. and xlix.), on chemistry of salt and of brines, and agricultural contributions to the *Reports of the Massachusetts and New York Boards of Agriculture*, the *Transactions of the New York Agricultural Society*, and the *Reports of the Trustees of the Massachusetts Agricultural College*.

GOETHE, gō'te, AUGUST VON (1789-1830). The son of Johann Wolfgang von Goethe (q.v.). He was born at Weimar and occupied the position of chamberlain to the Grand Duke of Saxe-Weimar. He died October 27, 1830, while visiting Rome. By his marriage with the Baroness Ottilie von Pogswisch, a highly accomplished woman, he had three children, of whom WALTHER WOLFGANG (1818-85) was known as a composer of operettas and songs, while his younger brother, WOLFGANG MAXIMILIAN (1820-83), was a jurist and poet.

GOETHE, JOHANN WOLFGANG VON (1749-1832). The greatest German writer and one of the greatest of the world, excelling in every literary genre, distinguished in many branches of science and in literary and artistic criticism. He was born in Frankfort-on-the-Main, August 28, 1749. Both his parentage and the place of his birth were significant for his future development. He was among the first of German literary men since the Meistersinger days to spring from a commercial environment and parents closely affiliated with political life in what remained of the old free cities. His father's father was a tailor and inn-keeper. His father received a good education, traveled in Italy, attained the distinction of Imperial Councillor, and, though never wealthy, was always in easy circumstances. He married (1748) Katherine Elisabeth Textor (or Weber), and Goethe was the first of their four children, of whom only himself and a sister, Cornelia, survived childhood.

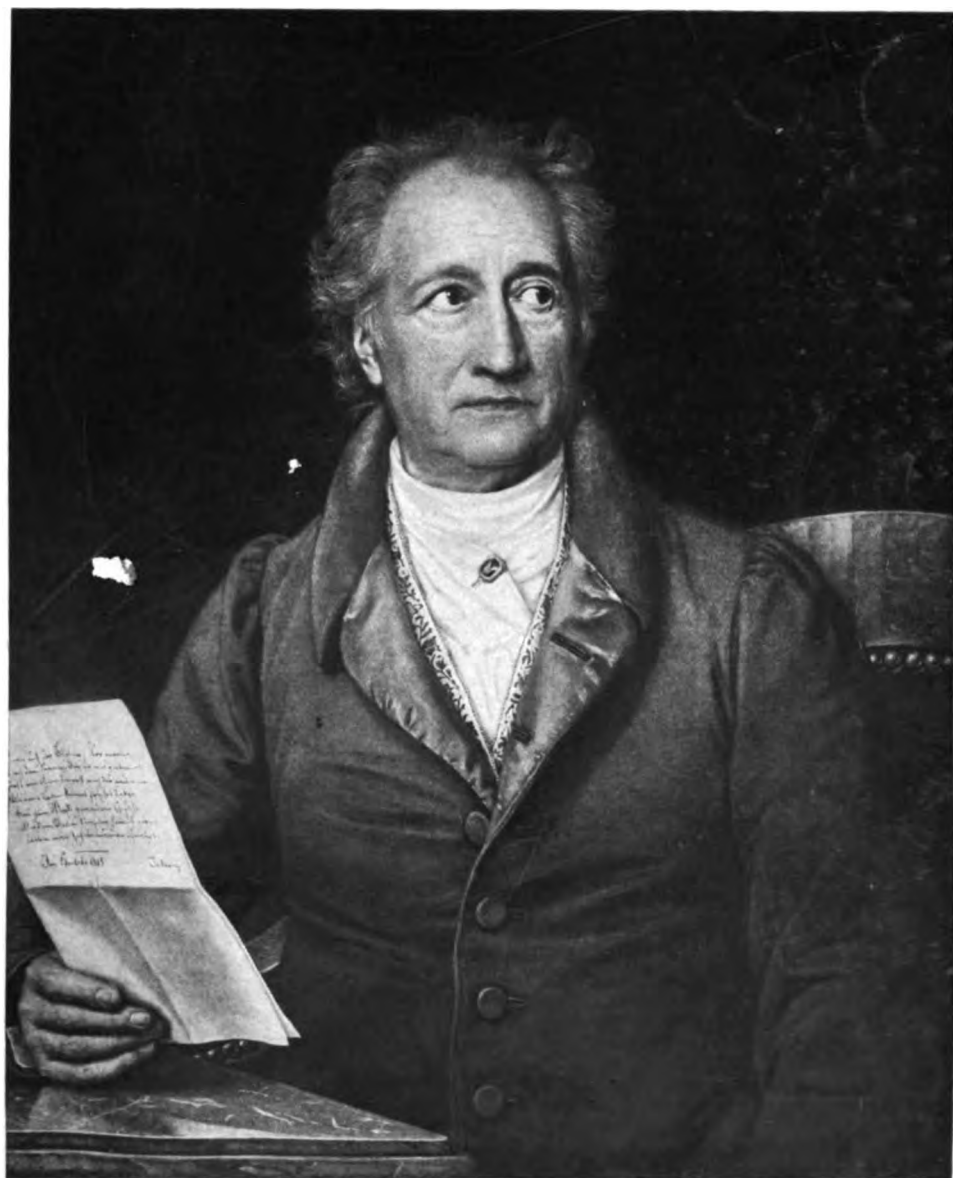
In the pages of Goethe's brilliant autobiographical *Dichtung und Wahrheit*, we seldom see the councillor unbend from his philistine self-satisfaction. But the mother must have been a very remarkable woman, simple, hearty, joyous, affectionate, not highly educated, but with a faculty of rapid assimilation that made her no unworthy companion or correspondent of persons of deeper culture or higher station. The relation of mother and child was ideal. His childhood and youth owed more to her direct influence than to all else besides. She died in 1808. Her *Letters* are published by the Goethe Society (1894). Consult Heinemann, *Goethe's Mutter* (6th ed., Leipzig, 1900).

But Frankfort, too, had a molding influence on him. It was a commercial city, then even more than now the centre of German financial life, of industrialism grafted on an old feudal stock. Old and new in turn and together left their impress on the brilliant and receptive boy. He was precocious, knew something at eight of Greek, Latin, French, and Italian, had acquired from his mother a knack of story-telling and from a toy puppet-show in his nursery a taste for the stage and a stimulus to imagination on which his autobiography lays much stress. He never went regularly to school, and as a child showed consciousness of superiority. The French occupation of Frankfort in 1759 served to polish his French, and still further to cultivate his interest in the stage. He continued to study books and men at Frankfort till he was sixteen, and had had one love affair, from which he recovered with the facile mobility of youth before he went to Leipzig to study law and be fascinated by his host's daughter, Kätchen Schönpkopf.

Leipzig in 1765 was a 'little Paris' in its social and literary ideals. Goethe's letters show that he quickly caught a spirit that accorded well with his nature. He studied little, wrote love songs, interested himself critically in art, learned far more about life than about law, lost his health, and by 1768 had come to look at life on its seamy side, and showed his disillusionment in a drama, *Die Mitschuldigen*, where vice and meanness in manifold variety find it convenient to forgive and forget. This was completed later in Frankfort. Another drama, *Die Laune des Verliebten*, begun in Leipzig, is an embellished version of his relation to Kätchen. It was his author's instinct to put into literary form every experience. All his works, he says, are confessions of his life. These two youthful dramatic essays, both in their matter and their form, show Goethe as a realist. He idealized neither the world nor individual characters.

Goethe returned ill to Frankfort in the autumn of 1768. He remained there sick or convalescent till April, 1770, gaining the while from the works of Lessing a sharpened æsthetic sense and a more balanced judgment. Here, too, he began the scientific studies that were later to round out his fame, and from an amiable acquaintance, Fräulein von Klettenberg, the Beautiful Soul of his *Wilhelm Meister*, he gained some insight into the phenomena of pietistic religious experience and became interested in alchemy and kindred lore, all of which proved useful for *Faust*.

With health restored Goethe went to Strassburg to continue his legal studies. This city, French in government and institutions, German in people and spirit, was a good place in which to complete a cosmopolitan training. Goethe set himself earnestly to work to learn dancing and to



GOETHE
FROM THE PORTRAIT BY CARL STIELER IN THE NEW PINAKOTHEK AT MUNICH

pass his preliminary examinations. He studied also music, art, anatomy, and chemistry. He had begun to work on his dissertation when, in September (1770) he met Herder (q.v.), and in October made the fateful acquaintance of Friederike Brion, the winning daughter of a pastor of Sesenheim. He loved her, and let her love him till her visit to Strassburg broke the idyllic illusion. He would not, perhaps he felt he ought not, ~~to~~ fetter his fortunes and his genius to a yoke so unequal. He left Strassburg (August, 1771), carrying with him a sense of wrong to be atoned. Similar situations haunt his literary work of the next years. The Marie of *Götz*, the Marie of *Clavigo*, the Clärchen of *Egmont*, the Gretchen of *Faust*, spring from this experience, of which he has left a charming and wholly objective account in his autobiographic *Dichtung und Wahrheit*. Friederike died unmarried in 1813. They saw one another without strong emotion on either side in 1779.

Meantime Goethe had formed a close intimacy with Herder, who was confined for months to his room through an operation on the eyes. This was hardly less important to Goethe's literary development than the psychic trial at Sesenheim. They read literary masterpieces and talked of them. Goethe learned through Herder to distrust French classical canons, to appreciate Shakespeare, and to realize that all poetic development must be based on national character if it is to be enduring or beneficent. It was Herder, too, who brought Goethe under the influence of Rousseau, as appears in *Götz*, and especially in *Die Leiden des jungen Werther*. Herder's influence was furthering, even when it was merely restraining, for Goethe was already meditating his *Götz* and even his *Faust*, and both profited by a maturing delay. But Herder finished his work for Goethe at Strassburg. When they met again (1776) Goethe felt he had nothing to gain, and presently it was he who repaid the old debt.

Goethe with his licentiate's degree went back to Frankfurt (1771), and began the nominal practice of law, contributing critical notices to the press, and working on *Götz*, which he intended for a more daring proclamation of the newly claimed liberties of the German stage than Lessing, who had won them, would have ventured or approved. It was the trumpet call of the decade of Storm and Stress (q.v.), in which German young blood held high carnival, and in a blind following of Shakespeare naturally showed more of his faults than of his spirit. *Götz* was a dramatic adaptation of the autobiography of a robber knight of the sixteenth century, striking in its local color and naïveté. In his sturdy independence Goethe saw foreshadowed the reassertion of individualism in the eighteenth century, and he made *Götz*, far more than that knight had made himself, typical of the national revolt against the Roman law and Church. For to Goethe at this time the only progress practicable for Germany lay in the stressing of individuality. But the play as written in 1771 proved too lawless even for his youthful taste. It was first printed in 1840, and remains a curious monument of a period of ferment. It appeared much modified in 1773, struck an answering chord in every heart, and made its as yet unnamed author the literary leader of his time. It gave an immense stimulus to dramatic production, though in casting all thought of the unities to the winds Lessing

thought the 'captivating monstrosity' retarded the development of dramatic art. Goethe may have thought so, too; for he subjected it to a radical revision many years later (1804) for the Weimar stage.

This was a period of manifold activity. To it belong some fine songs, among them the "Wanderer's Sturmlied," orations, essays, reviews, and minor work in much bulk, to which he was stimulated by the shrewd and cautious criticism of Merck, some of whose traits Goethe used for Mephistopheles. This production was interrupted by a new psychic experience. In 1772 Goethe went to Wetzlar to practice law, and fell in love with Charlotte Buff (Lotte), the betrothed of his friend Kestner. From the rather delicate situation thus created Goethe ran away (September 11, 1772), and on his way back to Frankfurt managed to find heart for a flirtation with Maximiliane von Laroehe, who was to be the mother of one of his last adorers, Bettina von Arnim-Brentano, and from home he writes to Charlotte that he 'found a new maiden,' Antoinette Gerock, presently to be succeeded in his facile heart by Anna Mönch, for whom he wrote *Clavigo*, giving literary expression the while to his Wetzlar experiences in *Die Leiden des jungen Werther*, which revealed powers in the German tongue till then unimagined and still unsurpassed. The story, which has been often translated into many languages, is sentimentally morbid and typical of its generation. It was suggested by the suicide of Jerusalem, a student who had formed an attachment for a friend's wife, similar to Goethe's for Lotte. But Goethe, having expressed the mood of his time and age, quickly recovered from it to enter on a period of great creative fecundity, the fruits of which were to appear later in *Faust*, *Prometheus*, *Egmont*, and *Stella*, as well as in many lyrics. Then came his passing betrothal to Lili Schöne-mann (died 1817), a banker's daughter, the nearest that he was ever to come to a love match. For her he wrote some very beautiful songs, and he cherished her memory till death. But for the time they drew apart (September, 1775), and soon after Goethe was invited by Karl August to be one of his Court at Weimar. Meantime Goethe had written *Clavigo* (1774) and many slighter pieces, among them *Götter, Helden und Wieland*, and had found in Merck, an army paymaster at Darmstadt, a friend and a caustically discriminating critic, of much value to him in the discipline of genius. His relations to Lili found expression a little later in *Stella* (1776). In May, 1775, he had made a journey to Switzerland with his friends the Counts Stolberg, and there became intimate with Lavater, whom he had already met.

The coming of Goethe to Weimar is a turning-point in the literary life of Germany. From 1776 Goethe's influence begins to be paramount wherever German is spoken. Weimar was already what it has remained till now, a pleasant residence for the cultured. Goethe made it the Athens of Germany, aided by Karl August and his mother, Amalie, hindered at first by Karl's prim wife, Luise, and by a jealous group of courtiers. Goethe was received in Weimar with an effervescence of enthusiastic appreciation. For a time he led the Court a frolic dance, but presently settled down to be a prudent and blameless man of affairs, and found in this courtly life and the intimate contact with aristocratic society

much to widen his mind and give his judgment a balanced calm. For the next ten years (1776-86) he wrote little save occasional verses and dramatic trifles, of which the chief is *Die Geschwister*. He began work on *Wilhelm Meister* in 1777. Study of natural science, mineralogy, geology, osteology, intercourse with Herder, Wieland, and others, and his interest in the mines at Ilmenau claimed his time, and he made a journey to the mining district of the Harz on their account, bringing back impressions that were of use, not only at Ilmenau, but for his *Faust*. He managed the Court Theatre (with some intermissions, till 1817) and the War Department, superintended the roads and bridges, accompanied Karl August on a journey to Switzerland, from which he gathered literary impressions and above all he maintained a platonic correspondence and intercourse with Charlotte von Stein, a lady of thirty-three, and mother of seven children, who, in making his life 'an enduring resignation,' gave his nature more refinement and self-control for the days of his emancipation. For when he had learned from her what she had to teach, he began to chafe both at this relation and at his Court life, until in 1786 he asked of Karl August unlimited leave of absence, that he might visit Italy. The literary precipitate of this decade is almost wholly lyric or epigrammatic; but he carried across the Alps the uncompleted *Iphigenie* (which in a prose form had been acted in 1779), *Egmont*, *Tasso*, and *Faust*—works not to be finished in the spirit of their inception.

For the Italian journey marks the most important epoch of Goethe's literary and moral development. All the work that follows is radically distinguished from all that went before. Here Goethe found at last his moral balance. From 1788 till his death he went his way among men with the serenity of perfect self-possession. He went first to Verona, then to Padua and Venice, where he stayed two weeks, and then turned southward to Ferrara and across the Apennines to Florence, where he lingered but three hours, so eager was the impetuous traveler to see Rome (October 29, 1786). Here the poetic stream that had long flowed so scantily was unsealed. By mid-January, 1787, he had turned *Iphigenie* into classic iambs, as a first fruit of the new influences, and was so sure that he was on the right track that he determined to do the same service for *Tasso* on a journey to Naples and Sicily, from which he returned in June.

In Rome he now remained nearly a year, perfecting *Iphigenie*, finishing *Egmont*, working on *Tasso* and *Faust*, and prosecuting zealously artistic and botanical studies. (He also lived connubially with a Roman girl, and the connection seems to have revealed to him a joy of life dissociated from the sentimentality that had characterized his previous relations, especially that with Charlotte von Stein. This new moral attitude is reflected in the *Römische Elegien* (1788), an epithalamium addressed to Christiane Vulpius, a young woman of Weimar, with whom he lived quasi-maritally from 1788 till their marriage in 1806, and afterwards till her death (1816), to his own satisfaction, but to the scandal of the ladies of Weimar and the vexation of Bettina von Arnim-Brentano. According to Goethe's correspondence with Christiane, but recently published (*Goethe-Gesellschaft*, Weimar), she was the true and faithful companion of his

after life, loving and beloved. His mother treated her from the first as 'her daughter,' and she earned, after the battle of Jena, the honor of a public recognition of her place by preserving, at the risk of her life, Goethe's house from French marauders.

Goethe brought to Weimar (June 18, 1788) *Iphigenie* and *Egmont*, with *Tasso* almost in its present form, and an essentially altered conception of *Faust*. *Iphigenie* was planned in 1776, and written in prose in 1779. It was a literary projection of his relation to Charlotte von Stein. Orestes recovers a clear mind in the angelic presence of his sister, as Goethe imagined he would do if Charlotte would 'be a sister' to him. Such ethics were unripe and unnatural, and the play lacks action. It was old work made over, and its exquisite versification did not suffice to make it harmonize with his new spirit. There is the same discord of old and new in the prose drama *Egmont*, 'the weak, aristocratic twin brother of Götz' (Hermann Grimm). *Tasso* has more unity of conception and execution, though it is sadly deficient in dramatic action, and, indeed, was not put on the stage for eighteen years after its publication (1790). It, too, in its pre-Italian prose form (1780-81) reflected Goethe 'caught in the snare' of Charlotte von Stein, a situation that in 1786 had ceased to have living interest for him. He concentrated his thought on its form, and made the iambs of *Tasso* so perfect that Schlegel said their very beauty made them unsuited to dramatic dialogue. He also changed the close to conform to his new ethical position.

Goethe's first homogeneous work after his return from Italy was the *Römische Elegien*, in the spirit, he said, of Tibullus, Catullus, and Propertius, the most antique in thought of modern German verse. The frankly naïve sensualism that they exhibit, borne out by his conduct, caused Goethe a temporary loss of social popularity in the 'imperfectly monogamous' society of Weimar, as well as a breach with Frau von Stein. He had outgrown her and the Weimar circle. Even his literary preëminence seemed threatened. In *Götz* and *Werther* he had led his countrymen. Now he had passed beyond them in his deepened æsthetic insight. For a time and until rejuvenated by the friendship of Schiller, he gave his time largely to scientific studies, to which he brought not only an original mind, but almost a seer's vision. In 1784 he had discovered the intermaxillary bone by a method that foreshadowed the science of comparative anatomy. In his essay *Die Metamorphose der Pflanzen*, he became, says Esenbeck, 'the tender father' of a just-born science; his experiments in optics were ingenious and valuable, though his theory of colors was false, and he was first to perceive the vertebrate character of the human skull. Thus, while his contemporary botanists and anatomists were wandering aimlessly or making dry registration of facts, he gave them ideas whose fruitfulness is not yet exhausted. From these studies Goethe was won back to literature by the friendship of Schiller.

Schiller had been living in or near Weimar since 1787, but a strange irony of destiny kept the poets estranged till 1794, though Schiller was drawing, unperceived, into closer sympathy with Goethe's classic ideals. Meantime Goethe's son August was born (December 25, 1789), the only one of several children to reach maturity. This and the storm clouds of the French Revolution led him to defer a visit to Italy, though in 1790 he

went to Venice to meet the Duchess Amalie there, and wrote a group of *Venetianische Epigramme*, that show how his quasi-marriage had helped him to a calmer judgment of Italian culture than that of the *Elegies*. Work in lighter vein now attracted him, *Wilhelm Meister* and the Court Theatre (the management of which he undertook in 1791), till in the summer of 1792 he was summoned by Karl August to join him in the invasion of France that was to culminate in the defeat of the Duke of Brunswick at Valmy. Goethe recorded his six weeks' impressions in his *Kampagne in Frankreich*, and returned to Weimar to find almost ready for his occupancy a mansion presented to him by the Duke, and now, as the home of the Goethe Society and its museum, inseparably connected with his name. The pleasure of this enlarged domesticity is reflected in *Reineke Fuchs*, written in 1793 and published in 1794, the adaptation to social satire of an animal fable that can be traced back to Æsop and to India, though Goethe's immediate model was a German rendering of the mediæval Flemish version of the fable by a certain Willem (about 1250). Out of this comic epic he made, without local or personal allusions, a social and political satire full of ease and vigor, a humorous apotheosis of impudence that has become and is likely to remain one of his most popular poems, though at the time it passed almost unnoticed.

Goethe had met Schiller on several occasions since 1779, and had secured for him a professorship at Jena, though it had seemed to him that the author of *Die Räuber* stood in the way of development of classical taste which, since his return from Italy, Goethe had been anxious to foster. But Schiller was himself developing along these lines, and when they came to understand one another, in 1794, Goethe may well have felt that Schiller, more than any other in Germany, was fitted to appreciate and aid him. He was first to speak of friendship, first to visit his new-found friend. Their intercourse grew constant, especially after Schiller came to Weimar (1799), and was interrupted only by Schiller's death (1805). To Goethe the relation was of stimulating rather than of directing force. He contributed to Schiller's periodical *Die Horen* (1795-97) the *Uebersetzungen deutscher Ausgewanderten* and the *Römische Elegien*, and to the *Musen-almanach* (1796-1800) his share of the *Xenien*—couplets of stinging literary criticism that aroused great excitement and lifelong enmities.

Up to this new influence *Wilhelm Meister's Lernjahre* (1795) was completed, a novel with no definite plot, its purpose being the unfolding of characters drawn from varied social spheres, wonderfully realistic studies involving much ripened worldly wisdom and philosophy. Mignon and Philine are enduring creations, the songs interspersed in the novel are among the most exquisite in any literature, and the analysis of *Hamlet* is a very acute criticism. Some fine ballads and elegies belong to this period also, and it closes with that hymn to the family and masterpiece of classic realism, *Hermann und Dorothea* (1797). Here all is studied from life: there is no idealization, no sentimentality. It was an old story, but instinct with a conservative patriotism in these years of revolution and social upheaval. Other less important works of this period are a realistic drama, *Die natürliche Tochter*, and *Achilleis*, an attempt to continue the *Iliad*.

Some work was done on *Faust* also; but sickness and public cares interrupted it, and the first part was not published till it was included in the first edition of Goethe's *Works* (13 vols., 1808).

Meantime Goethe had lost many friends—Gleim, Klopstock, and Herder in 1803, Schiller in 1805, his mother in 1808. In that year Goethe came in frequent contact with Napoleon at Erfurt. It was about this time, too, that Bettina von Arnim-Brentano conceived that violent attachment for him that appears in her *Goethe's Briefwechsel mit einem Kinde*, which, however, does not represent an actual correspondence; but Bettina could not endure Christiane, and the acquaintance ceased after 1811. In 1809 Goethe published his second novel, *Die Wahlverwandtschaften*, a story of the conflict of love and conjugal duty, with a tragic close. Though now little read, its influence has been great, for it is the starting-point of German psychologic fiction. It has also an autobiographical value. Charlotte is Frau von Stein, and Edward is what Goethe felt he might have become. Ottilie has been thought by some, probably wrongly, to be studied from a young Jena girl, Minna Herzlieb.

From 1811 to 1814 appeared the first three parts of *Dichtung und Wahrheit*, one of the most fascinating autobiographies in any language. It is early memories seen through a long vista of years and under the transforming influence of an artist's eye, beginning with infancy and closing with his coming to Weimar. Meantime the War of Liberation had restored national independence to Germany; but while the fate of his country was changing before his eyes Goethe was studying the Oriental poets and checking the effect of their exuberance by renewed reading of Homer. It was in these years that he wrote in great part the *West-östlicher Divan* (1810), foreign in externals, mysterious and oracular in parts, but aiming to cultivate international sympathies, social and literary, in years of intense Chauvinism. The *Zuleika* poems in the *Divan* have been thought to be addressed in gracefully platonic affection to Marianne Willemer, wife of his congenial host on a journey to the Rhine in 1815, but this is very doubtful. He also undertook at this time some antiquarian studies, standing intentionally aloof from the temporal aspirations of the German people that he might labor more effectively for their intellectual uplifting.

The *West-östlicher Divan* is the last work of Goethe's long connubial life. Christiane had died in 1816. He felt the blow severely, and said that what remained of life to him was but time granted "that he might mourn her loss." His directorship of the Weimar Theatre he gave up in 1817. But the years that remained to him, "testamentary years," he called them, were to yield much of interest. *Wilhelm Meister's Wanderjahre* may indeed seem dreary reading, though it contains many wise pedagogical observations and some episodes that recall the narrative power of Goethe's prime. To these years, also, we owe the Second Part of *Faust*, the necessary complement of the former, with its teaching that men rise by unselfish altruistic effort. Here, as Scherer noticed, Faust chooses, not wealth, but work, and finds in that choice his salvation. ~~Mediator~~ Gretchen brings him to the choice; immediately, Helena, the incarnation of Greek ideals, as though to suggest that beauty is positive, creative, revealing the worth of life, and

freeing Faust at last from the Mephistophelean spirit of negation. So the teaching is the same as that of *Wilhelm Meister*. The scholar, as the poet, passes, in Goethe's conception, from a groping, contemplative, searching æsthetic existence under the spur of negative spirits and ideal models, to active, useful labor. Here is to be found Goethe's philosophy of life, which aims to realize the ideal by the idealization of the real, to correlate action with thought. "The rest of my life may be regarded as a free gift," he said as he sealed the manuscript of this Second Part of *Faust*. "It is now really indifferent what I do, or if I do anything at all." It was his philosophic testament to Germany.

It is to this last period, too, that we owe the Conversations (*Gespräche*) with Eckermann, which have preserved to us much keen criticism of men and things, for during these declining years he continued to be in closest touch with the intellectual movement of his own country and of others. Weimar became a goal of pilgrimage to men of many minds and nations. He seemed to Germans the survivor, almost the last, of a heroic age. Some of these visitors give us glimpses of the old man's life, among them Heine, Thackeray, and his old friend Lottie Kestner. After his wife's death he traveled but little, seldom farther than Jena, lingering especially over places associated with his prime, and toward the last working intermittently, as health permitted, on the annals of his Weimar life. In 1828 Karl August died, followed two years later by Goethe's son August, whose widow, Ottilie, cared for her father-in-law to the end. In the same year (1830) Grand Duchess Luise passed away. So Goethe was left, almost the last of his generation. He died in Weimar March 22, 1832, in his chair, so peacefully that men did not know the hour. Eckermann, who saw his body as it was prepared for burial, noted the deep peace and firmness of the features, the magnificence of the limbs, the broad, strong, and arched chest. Nowhere on the body, he says, was there a trace of wasting. "A perfect man lay in great beauty before me." This body lies now, with that of Schiller, in the ducal mausoleum of Weimar in front of the bronze coffins of the two princely patrons of both, Luise and Karl August.

This is the most completely rounded literary life in history—a life of monumental proportion and yet of perfect symmetry, responsive to all intellectual impulses of art, philosophy, and science, open to every light, yet self-poised and self-controlled till its calm seems Olympian. Goethe is at once the representative and the prophet of the modern spirit, reconciling the antinomies of the ideal and the real in the world-wisdom of his *Faust*.

The literature that has gathered around Goethe would fill a library—indeed, it does so in the Goethe archives at Weimar, whence issue the *Goethe Annual* and the great edition of his works, embracing, also, the *Tagebücher* and *Briefe*, which is now drawing to completeness. Besides this edition may be named Heinemann's annotated edition of the *Werke* which began to appear in 1901 (Leipzig). Of the *Briefe*, there are annotated selections by E. von der Hellen (Stuttgart, 1901 et seq.) and Stein (Berlin, 1902 et seq.), who has edited also the correspondence with Schiller (Leipzig, no date). The correspondence with Frau von Stein is best edited by Schöll (3d ed., Frankfurt, 1889-1900). Eckermann's *Ge-*

sprache are edited with an introduction and notes by Moldenhauer, and, better, by Bartels (Leipzig, 1902). Von Biedermann has also edited Goethe's *Gespräche* (10 vols., Leipzig, 1889-1896).

Of the lives of Goethe, Düntzer's (Leipzig, 1883) is the most complete; Schäfer's, though old (Bremen, 1851, often reëdited), not antiquated; Goedeke's *Goethes Leben und Schriften* (Stuttgart, 1877) is shorter. Popular biographies are those by Heinemann (Leipzig, 1899), Prem (ib., 1900), Witkowski (ib., 1900), and Bielschowsky (Munich, 1902 et seq.).

Among recent studies of Goethe the more significant are: Von Biedermann, *Goethe-Forschungen* (1st series, Frankfurt, 1879; 2d and 3d series, Leipzig, 1886, 1899); Richard M. Meyer, "Goethe," in Bettelheim, *Geisteshelden* (Berlin, 1898); Hermann Grimm, *Goethe-Vorlesungen* (6th ed., Berlin, 1899); Düntzer, *Zur Goethe-Forschung* (1891); Zarncke, *Goetheschriften* (Leipzig, 1897); Bernays, *Der junge Goethe* (Leipzig, 1875); Weissenfels, *Der junge Goethe* (Tübingen, 1899); Menzel, *Der Frankfurter Goethe* (Frankfurt, 1900); Diezmann, *Goethe und die lustige Zeit in Weimar* (2d ed., Weimar, 1901); Burkhardt, *Goethes Unterhaltungen mit dem Kanzler Müller* (1879); Fischer, *Goethe und Napoleon* (Frauenfeld, 1901); Funk, *Goethe und Lavater* (Weimar, 1901); Virchow, *Goethe als Naturforscher* (1861); Sell, *Goethes Stellung zu Religion und Christenthum* (Freiburg, 1899); Vogel, *Goethes Selbstzeugnisse über seine Stellung zur Religion* (Leipzig, 1899); Scherer, *Aufsätze über Goethe* (Berlin, 1900); Bode, *Goethes Aesthetik* (Berlin, 1901). To celebrate the one hundred and fiftieth anniversary of Goethe's birth there was issued *Goethe, eine Biographie in Bildnissen* (Leipzig, 1899), a folio with 166 portraits. See, also, for Goethe's descendants, Von Gerstenbergk, *Ottilie von Goethe und ihre Söhne* (Stuttgart, 1891). Lewes's *Life* (London, 1855) is the best in English. *Wilhelm Meister* has been admirably translated by Carlyle, *Faust* by Bayard Taylor and many others. Some of the lyrics have been rendered masterfully by Longfellow and others, but there is no worthy rendering of the poems or dramas as a whole.

GOETHE, KATHARINA ELISABETH, known as "Frau Rat" (1731-1808). The mother of Johann Wolfgang von Goethe. She was born at Frankfurt-on-the-Main, and was a daughter of Johann Wolfgang Textor, a prominent citizen of that city. At the age of seventeen she was married to Johann Kaspar Goethe, by whom she had four children. She was a woman of exceptional intellect, marked individuality, and a delightfully joyous cast of mind, as evidenced by her letters, and in the frequent references to her found in the works of her son, upon whose intellectual development she undoubtedly exerted a remarkable influence. She was made the heroine of the work by Bettina von Arnim entitled *Dies Buch gehört dem König* (1843), and is one of the central figures of Gutzkow's famous play, *Der Königsleutnant*. Much of the correspondence of Katharina Elisabeth Goethe has been published in *Goethe's Mother, Correspondence of Katharine Elisabeth Goethe with Goethe* (Leipzig, 1889). Her letters to the Duchess Anna Amalia were published at Weimar in 1885. Consult: Keil, *Frau Rat* (Leipzig, 1871); Eric Schmidt, *Charakteristiken* (Berlin, 1886); Heinemann, *Goethes Mutter* (6th ed., Leipzig, 1900).

